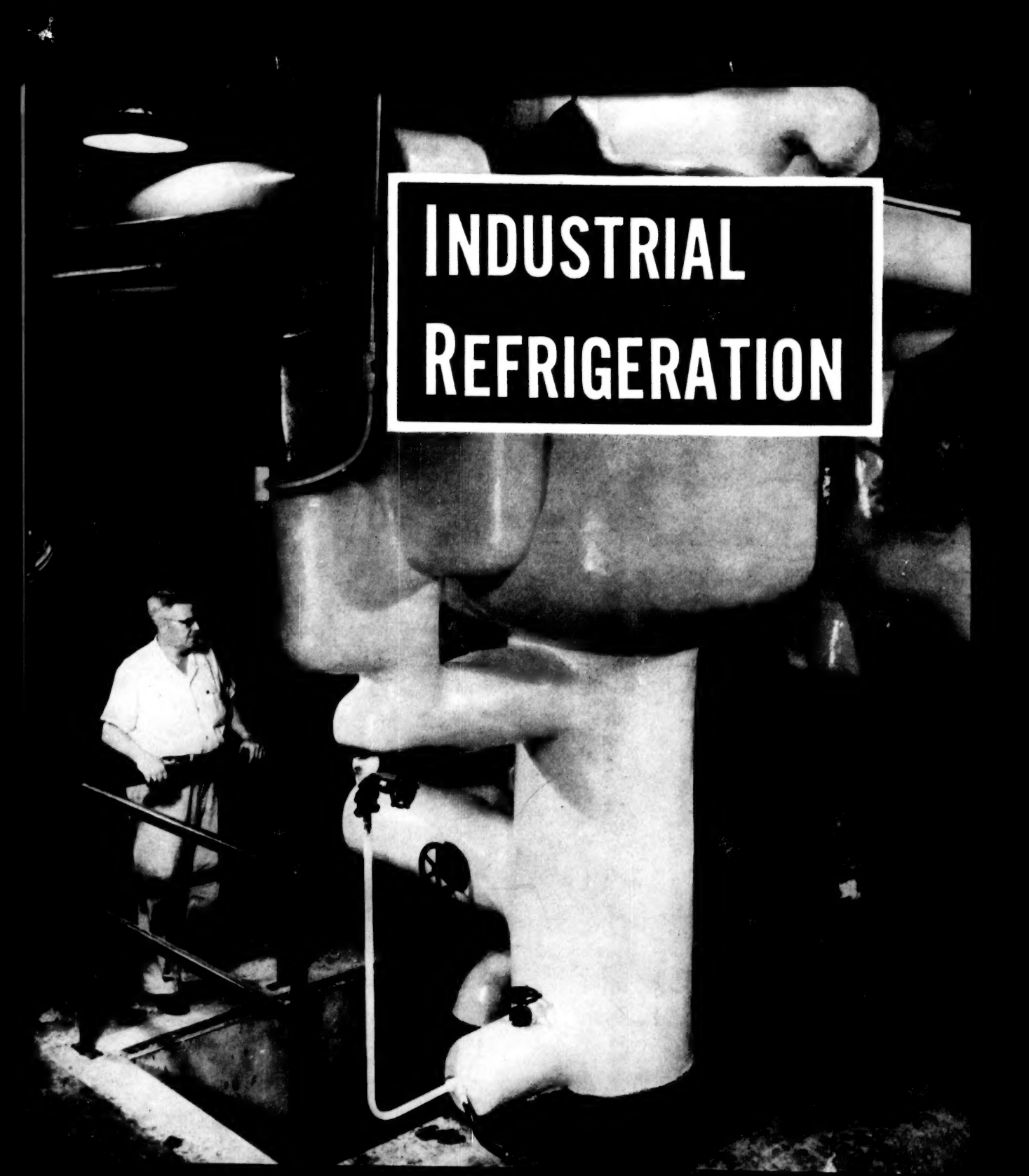

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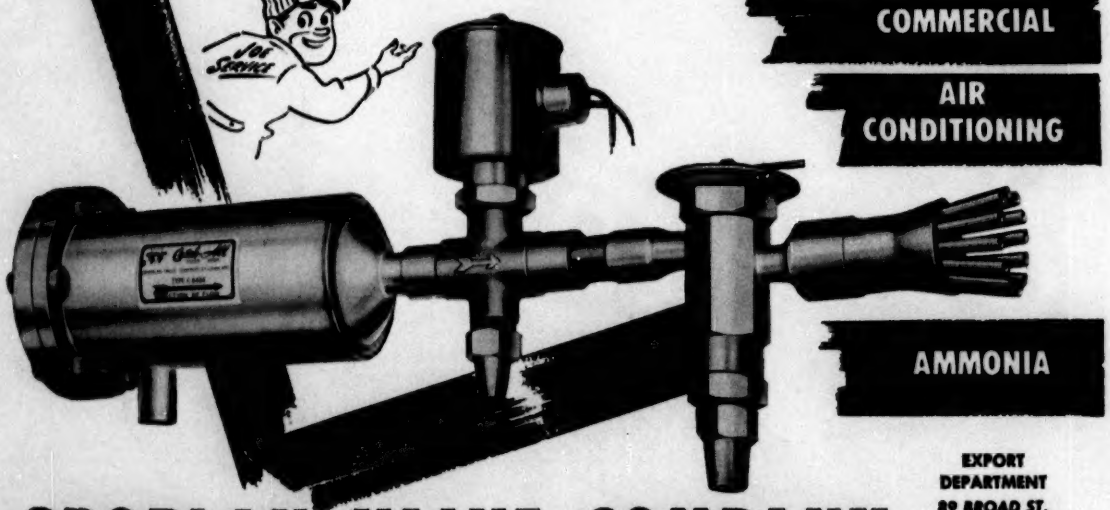

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COOLER FREEZER

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STAND-OUT

Solar Energy May Produce Refrigeration

SOLAR engines for producing power for refrigeration, house heating, and other purposes was envisaged by Prof. Farrington Daniels of the University of Wisconsin, who outlined some of the promising fields for research on utilizing the sun's energy in a talk opening a conference attended by nearly ninety foreign scientists and most leading American solar energy scientists. A two-day conference was held at the University of Arizona on scientific bases of the utilization of solar energy, followed by a five-day conference at Phoenix, devoted to broader economic, social and development problems posed by advances in solar research.

Prof. Daniels said a great need exists for cheap and long-lasting materials with which to build parabolic mirrors for collecting and focusing the sun's rays. "These fields of direct utilization all involve principles of physical chemistry and engineering and as yet many of them haven't been explored very fully," he said. He added that while these research areas will probably be the subject of research in the near future "our long-range hope lies in photochemical and photo-electrical methods of utilization.

"Trapping of the sun's energy for power probably will not take place extensively near large cities," he pointed out. "Because the intensity of sunlight is low compared to that of conventional fuels, it is necessary to have large areas for collectors." He explained some design problems faced by engineers: "If focusing reflectors are used to give higher temperatures there will be higher temperature and higher efficiency, but the higher economic cost of the reflectors will tend to offset the thermodynamic gain. hand the steam engine must be larger,

"The solar equipment can be simpler and cheaper if low pressure steam is generated, but on the other heavier, and more costly for low-pressure steam than for high-pressure steam. The engineer must calculate the optimum conditions for each case."

Utilization of solar energy will most likely come first where labor is cheap and where hand-labor is abundant. "Operating costs can be higher if capital investment costs are lower," he said. "The operator could walk among a group of reflectors, adjusting each in turn to the sun. The frequency with which a reflector or an absorber must be dusted off also may be important in determining the cost of operation.

"The limit to the size of the collector may be set not by engineering and economics of operation but by

(Continued on page 50)

Industrial Refrigeration

formerly ICE AND REFRIGERATION
Now in its 64th Year of Publication
J. F. NICKERSON, FOUNDER

Vol. 129 December, 1955 Number 6

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The Cover

A liquid-return system installed by Vilter Manufacturing Company in a Kentucky brewery. This system uses a liquid-return pump to transfer liquid at 35 psig to the high-side. The pump is in the pit and pumps liquid from the 48-inch diameter accumulator to the liquid line which runs from the receiver to the evaporators. See story starting on page 13.

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What's New

MACHINERY
APPLIANCES • PROCESSES

Dual Compartment Testing Cabinet

AN environmental testing chamber developed by Harris Refrigeration Company of Cambridge, Mass., permits simultaneous yet individual testing of two portions of an operating system. The operating portion can be placed in one compartment and subjected to temperatures ranging from minus 100 to 200 C. Meanwhile, controlling instrumentation is isolated in another carefully regulated chamber. Models with two or more chambers are available. The Harris unit is thus well-suited for testing automatic control equipment and airborne systems where elements of the same equipment must operate under different environmental conditions.

New Dual Compartment Environmental Testing Chamber

Each chamber of the Harris multiple unit has thermostatic temperature control accurate to plus or minus 1 F. Circulating fans maintain constant temperature throughout the chamber. Cooling capacities of 750 to 3000 Btu/hour at minus 100 F may be specified. Temperature pull-down time from room temperature to minus 100F is 50 minutes. When hot environments are required, temperatures of 180 F or higher can be attained in 30 minutes.

The upright cabinet provides convenient accessibility to systems undergoing test. Thermopane doors and low-temperature compartment lighting permit reading instruments without interrupting tests. Condensation and frosting around the door gasket are prevented by low-wattage heating elements which automatically control the temperature of the gasket near room temperature. The cabinet unit is constructed entirely of welded steel, re-enforced throughout, and is finished in gray Hammerloid.

All compartments in a Harris multiple cabinet are cooled by a single, cascaded compressor unit. All expansion valves, solenoids, and regulators have been eliminated in this simplified system for trouble-free operation. The sealed compressors require practically no service. An efficient cooling system eliminates piping around the chamber walls. Honeycombed channels embossed in double walls provide direct refrigerant contact with 96 percent of the entire wall surface. High temperatures are provided by oven-type heating elements.

Ice Cart Provides Mobile Service

THIS improved Model 75 ice cart (as illustrated) serves a wide variety of establishments where mobile ice service is a necessity, space at a premium, the budget tight. It carries 75 pounds of cubed, cracked or flaked ice; is made of 22 gauge stainless steel throughout, including lift-off lid; 3 inch heavy duty insulation insures only minimum melting on a 90 degree day; is easily maneuverable on two stationary and one pivoted 5 inch hard-rubber wheels; only 19⅛ inches wide, 30 inches long overall. Hand operated drain through bottom. Manufactured by Gennett and Sons, Inc., Richmond, Ind.

Mobile Ice Cart made by Gennett & Sons,

Magnesium Dock Board Loading System

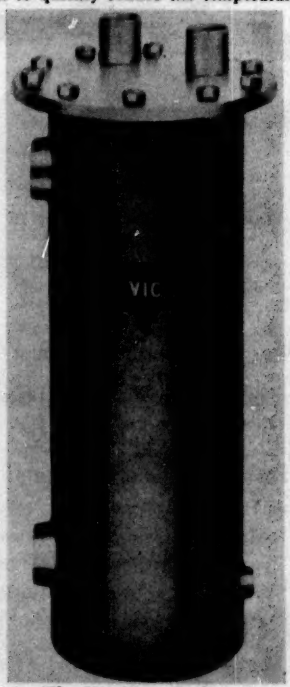
A MAGNESIUM dock board loading system, specifically designed for permanent installation on concrete docks, has been announced by Magline Inc. of Pinconning, Mich. The dock board units, called Perma-Docks, are believed to be the first of their kind to be manufactured of magnesium, and, according to the company, represent a new departure in permanent-type installations.

Combining the strength and lightness of magnesium, the new Perma-Docks are raised or lowered by one man. No power operated devices or counter balances are required. The recessed type of dock installation permits the dock board unit to self-adjust to truck level, and automatically compensates for truck spring deflection. The system requires no maintenance.

The New Magnesium Dock-Board

Heat Exchanger For Solvents

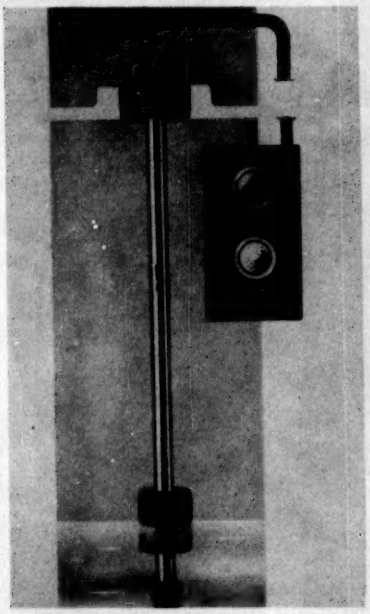
A HEAT exchanger for reducing the heat of solvents has been designed by the Vic Manufacturing Company, Minneapolis. It operates through the use of cool water and it is claimed can be counted upon to quickly reduce the temperature in any critical liquid to the point best suited for efficient operation. Since the manufacturing processes vary so greatly in different plants, it is suggested that those interested write direct to the Vic Mfg. Co., Minneapolis 3, Minn. for complete information.



The Vic Heat Exchanger

Liquid Level Indicator

A NEW instrument designed to indicate accurately the level of a liquid in any tank or other container has been developed by The Gems Company, Newington, Conn. Designated the Model LI-800 Level Indicator, this unit is described as simple, dependable and easy to install. The design provides adaptability to individual requirements; models can be supplied to indicate high and/or low level and, if desired, any number of intermediate levels.



Gems Model LI-800 Level Indicator

In operation, changes in the liquid level cause a foam plastic float to move up or down the indicator stem. As the float passes preselected points on the stem, hermetically sealed switches are actuated. These, in turn, may be arranged to operate indicating or warning lights on an instrument panel, or other signal devices. Using suitable relays, pumps or other power-driven equipment can be started or stopped automatically.

Since the head assembly of the Level Indicator is a standard pipe plug, the instrument is easily installed in any tank in the same manner as any similar fitting. Wiring is also simple; indicating lights or devices are readily located at any convenient, remote point.

New Mounting Bracket

THE elimination of complicated or makeshift mounting brackets, or the need for an accessible, flat surface on which to place portable draft gages, is now achieved with the new Dwyer Magneclips according to the F. W. Dwyer Mfg. Co., Michigan City, Ind. Magneclips (magnetic mounting clips) make a one-man job out of taking draft or pressure readings in hard-to-reach places. A "magneclipped" gage clings to any steel surface . . . grips instantly, securely (15 lbs. test-proved) . . . and can be adjusted easily to an accurate, level setting that won't shift or vibrate out of position, according to the manufacturer.

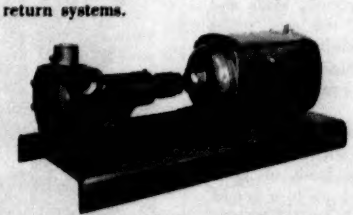
Magneclips are being included as standard equipment on all Dwyer portable Vertical and Inclined Manometers of solid

New Dwyer Magneclip and (below) showing method of mounting

plastic construction; on Nos. 1210, 1215 and 1230 Flextube Manometers; and on the Series 1211 Slacktube Manometers. They are drilled on one side and are fastened with a self-tapping screw to Flextube and Slacktube Manometers. On gages of solid plastic construction, Magneclips simply slide on by hand pressure and are secured to the gage by strong spring action.

Rex Engineering Enters Liquid Return Field

LIQUID ammonia pumps for return systems are now marketed by Rex Engineering & Sales Co., of Oklahoma City. The firm has one model which they claim takes care of any refrigeration plant, regardless of size. The firm invites inquiries and provides literature on the pump and return systems.



Rex Liquid Ammonia Pump

This Rex Engineering pump is designed to take care of the slop-over and protect the first stage compressors in any refrigeration plant—regardless of capacity in tonnage. Excellent inlet characteristics with a minimum of drop—no cause for turbulance—and ability to handle pockets of vapor.

Capacity is 5 to 15 gpm for return systems that generally operate on a gauge pressure of −10 in. vacuum to 165 psi. For recirculating ammonia, it will handle 25 gpm for pressures −10 in. vacuum to 15 to 20 psi.

Worthington Provides Liquid NH_3 Pumps

THE PROBLEM of protecting ammonia compressors against admission of liquid slop-over has been given a great deal of study by Worthington engineers. Regardless of the skill with which equipment is designed, manufactured, and installed, it is inevitable that sudden fluctuations in load will tend to bring liquid from the evaporator to the suction line. This effect is due to the rapid boiling of refrigerant, during which the vapor carries drops of liquid towards the compressor suction.

To avoid this hazardous and uneconomical situation, several suction-line arrangements have been used. These are discussed in page 705.35 through 705.38 of Worthington's Application Data. While satisfactory in many cases, most of these systems are susceptible to a build-up of liquid when fluctuations of load are very heavy and frequent. This liquid, if not removed, would make its way to the compressor.

As a positive means of insuring against liquid in the compressor suction, Worthington has developed a pump which automatically empties the knockout drum before it becomes dangerously full. This pump application must be made in accordance with certain definite requirements determined by experience, particularly proper venting and suction-line arrangement. Correctly applied, it will definitely eliminate the problem of liquid in compressor cylinders, whether the installation is new or existing. The saving in life of the compressors and contribution to safety of equipment and personnel will justify adding this equipment in cases where the character of the load warrants its use.

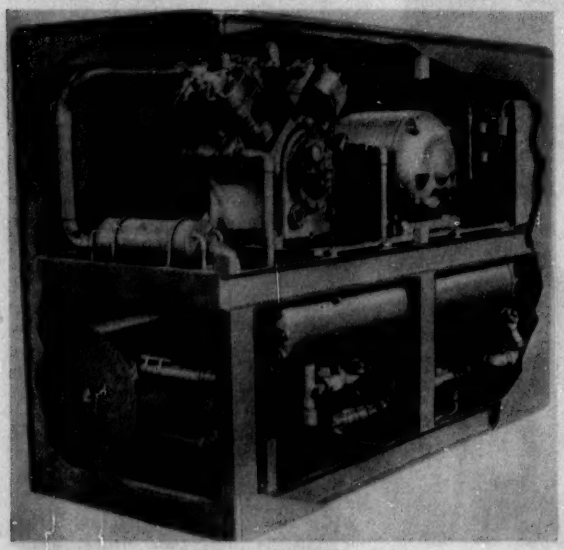
New Precision Drive

NEW literature published by Electric Machinery Mfg. Company, Minneapolis, illustrates the new "Ampli-Speed" magnetic drive, which provides precise, adjustable speed power for a wide range of applications. The four-page folder explains use of the drive for both fan-type (centrifugal fans, pumps, compressors) and constant torque loads (conveyors, mixers, machine tools etc.)

Construction features are illustrated clearly. Pictorial drawings show the relationship of the drive to its magnetic amplifier control, the driving motor and driven load. The "Ampli-Speed" drive, it is pointed out, can be installed between an existing motor and load, or as an integral part of new machinery. The folder lists many advantages obtained by means of this source of speed control, and gives detailed information on horsepower ratings, speed ranges, and speed control precision for both variable torque and constant torque loads, and also shows important dimensions.

Packaged Liquid Chillers

A NEW line of packaged liquid chillers has been introduced by Bell & Gossett Company, Morton Grove, Ill. For many years the company has been manufacturing most of the component parts of refrigeration and air conditioning systems as original equipment for other manufacturers, it was explained. The new liquid cooler, therefore, is primarily a B&G product, not an assembly of purchased parts.



Packaged Liquid Chiller made by Bell & Gossett Co.

The new line of Packaged Coolers has many new and exclusive design features as outlined by the new catalog just released. Available in capacities from 7½ to 50 tons, each unit is complete, ready for operation with just the basic connections. The unit is shipped with a complete charge of Freon F-12 refrigerant and a completely pre-wired panel box. The control system requires only the power supply. The unit is available with an enameled jacket. All parts, however, are easily accessible.

The new catalogs covering the entire line of B&G Packaged Liquid Coolers are available on request. A complete set of capacity ratings and specification sheets for all sizes is available.

New Bakelite Pallet Supports Heavy Load

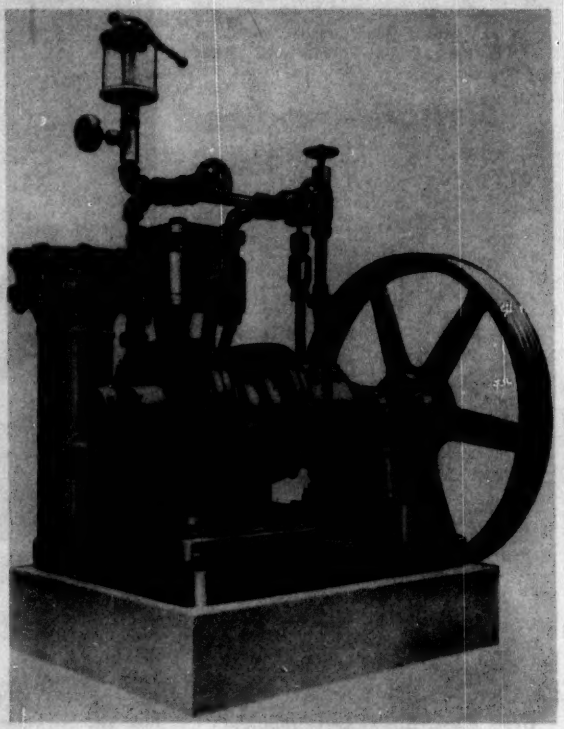
A NEW type of materials handling pallet weighing only 28 pounds is molded of Bakelite polyester resins reinforced with Fiberglas to support 3,000 pounds of working load has been introduced by Firmaline Products Inc., Midland Park, N. J. High strength at low weight combined with resistance to wear, abrasion and impact, it is claimed, provide means for lowering operating costs in materials handling. Resistant to oils, grease, acids and alkalies, Bakelite polyester resins molded into the new pallet have a surface that is easy to keep clean and sanitary by steam sterilizing at temperatures up to 325 F. Molding the pallet of reinforced plastic eliminates the need for nails or fasteners which can loosen and damage a cargo.

Nine hollow legs molded into the platform are spaced to allow a four-way approach for fork lifts. Resting on the outside legs only, the pallet is designed to support working loads of 3,000 pounds. Nested together, 100 of these pallets stack up to a height of only 7 feet, 8 inches, and occupy only 102 cubic feet of storage space. The strength of the reinforced plastic construction made with Bakelite polyester resins limits deflection even on an overload of 5,000 pounds with the pallet supported on forks, according to the manufacturer. Two pallets nested together have nearly double the strength of one.

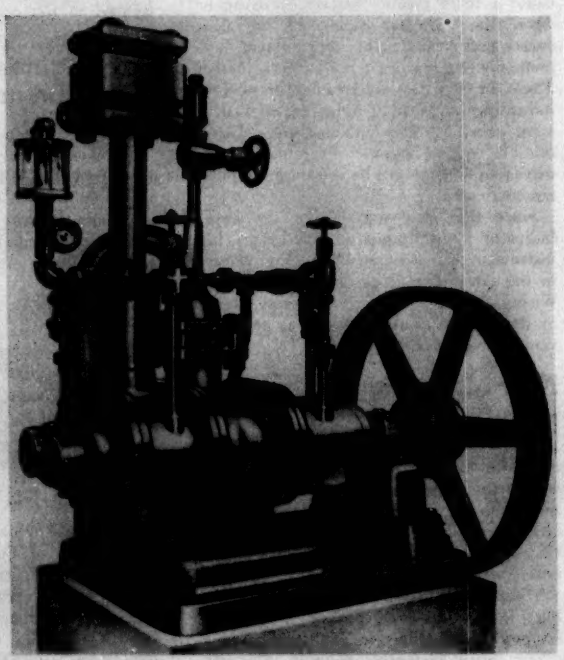
Strength and rigidity increase at sub-zero temperatures and the pallet is not affected by rot or rust. High strength-weight ratio is obtained by sandwich type construction with high strength facing and lightweight core.

Liquid Refrigerant Pumps Single and Two-Stage

LIQUID refrigerant pumps are furnished by Frick Company, Waynesboro, Penna., in both single-stage and two-stage types. Both use a special design of timed gears; these are turned by an independent set of driving gears, immersed in a bath of oil, while the pumping gears are set with the timing adjustments so that



Frick single-stage liquid pump



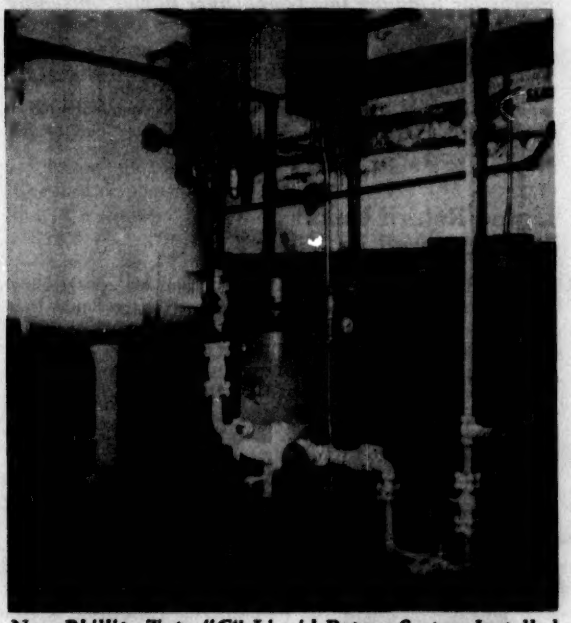
Frick two-stage liquid pump

they actually never touch each other. This design prevents both excessive wear and the tendency to heat. The driving gears are also provided with an adjustment to compensate for wear.

The single-stage pumps are used for handling refrigerants in pressure differentials varying from 5 to 125 lb. per square inch gage. The two-stage pumps are applied to the higher pressure differential ranges of 150 to 225 lb. The Frick pumps are equipped with equalizing connections throughout and a special check valve with automatic bypass in the discharge, which protects the pump from flooding back and from becoming gas-bound when shut down. These pumps handle ammonia, Freon-12, Freon-22 and other refrigerants.

Phillips Liquid System

A NEW PHILIPPS liquid return system for ammonia that protects compressors from liquid "slop-over" and permits more efficient refrigeration has been developed for use where headroom is limited in cold storage and freezing plants, ice cream plants, dairies, breweries and other industrial refrigeration systems. The new system will drain accumulators within 28 inches of the floor and may be installed in existing plants where other Phillips return systems will not fit.



New Phillips Type "G" Liquid Return System Installed in a Mid West Cold Storage Plant.

The system is a combination of a gravity drain and motor driven pump which returns "slop-over" to the receiver. Unlike other pump arrangements for this purpose, however, the pump does not raise the liquid from suction to head pressure. Instead, a liquid trap and system of automatically operated valves are used between the accumulator and pump to bring the pressure of the accumulated liquid ammonia to head pressure before pumping begins. This considerably reduces wear on the pump and attendant maintenance problems since "flashing" of the liquid is eliminated. By returning the liquid to the receiver without regenerating it, the system saves power and refrigeration potential.

Liquid Refrigerant Pumps

A WIDE range of application is provided by the new C and R series pumps offered by Dean Bros., Indianapolis, Ind. A considerable number of these pumps, particularly the C series units, are in operation in refrigeration service, handling chilled water and refrigerants such as anhydrous ammonia and "Freon" in heavy duty industrial refrigeration systems, and propane in refinery and petro-chemical processes requiring refrigeration.

In all cases where these units are handling refrigerants, the pumps are equipped with mechanical seals. Double mechanical seals are furnished where high working pressures as well as

NEW TAYLOR BI-THERM* DIAL THERMOMETER

So easy to read it invites frequent reading!

A simple, dependable, and economical thermometer with many practical applications in industrial refrigeration. Wide variety of ranges from minus 40° to plus 750°F. Available with three or five inch dials, and stem lengths of 4, 6, 9, and 12 inches.

EASY TO READ: The large dials are highly readable because of black figures and graduations on an aluminum background.

RUGGED: All exposed metal parts are of arc welded, corrosion-resistant stainless steel. All instruments are waterproof. All mechanical connections are welded for greater toughness and reliability.

ACCURATE: These instruments are accurate within ±1% of range, over the entire range. Simple zero-setting features correct minor errors in readings which might result from severe mechanical shock. No ambient temperature effect. Overrange protection 50% up to 500° F.; 10% above 500°F.

VIBRATION DAMPED: All instruments, except the 200° to 750°F. range, are silicone damped against vibrations. Result is increased speed of response, no zero shift due to shock, minimum pointer vibration, and elimination of pointer chatter when the thermometer is handled.

ECONOMICAL: Costs only **$16** to **$26,** depending on dial size and length of stem. Ask your Taylor Field Engineer, or write for **Bulletin 98267.** Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

*Trade Mark

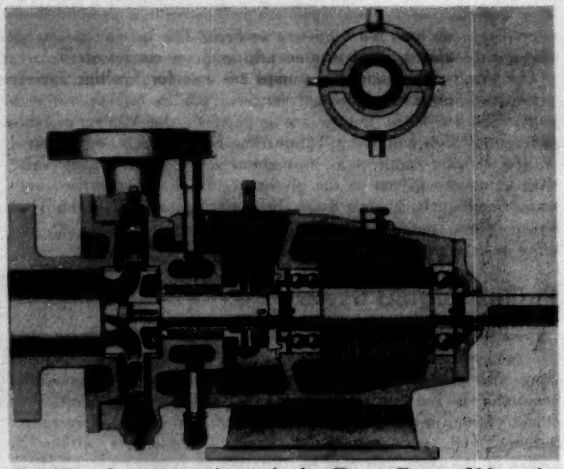
Taylor Instruments
MEAN ACCURACY FIRST

SPEED up TRAFFIC with PREST-O-MATIC® ELECTRIC COLD STORAGE DOORS

Open-through-close door cycle is completed in 8-10 seconds automatically. Users report expensive man-truck-hours are fully utilized at top efficiency — more goods are handled in less time. "Open-door-time" is reduced up to 75%, resulting in substantial refrigeration savings and maintenance of lower temperatures.

PREST-O-MATIC doors are packaged, complete units easily installed against any wall opening without loss of floor space. Full width of doorway is usable. Electric operation is fast, safe and automatic. Send for complete information or consult your architect. CLARK DOOR COMPANY, INC., 506 HUNTERDON STREET, NEWARK 8, N. J.

FINE DOORS SINCE 1878 CLARK DOOR CO.

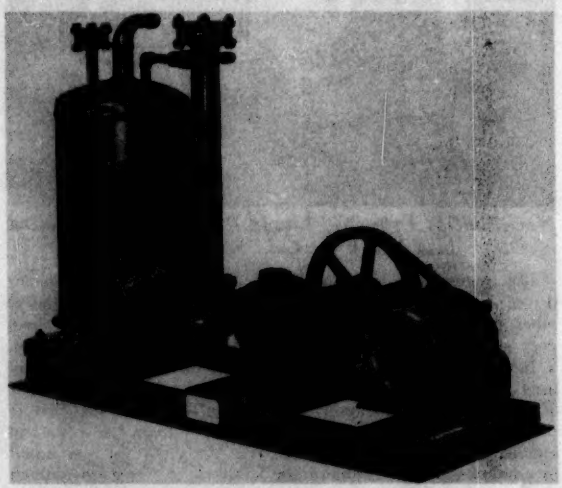


Details of construction of the Dean Bros. C10 series pumps for handling low temperature liquids, including refrigerants.

very low temperatures are involved. For extremely low temperature operation, the mechanical seal must be manufactured of special materials to prevent possible seal failure due to low temperature embrittlement.

Liquid Return Units Manufactured by Vilter

THE VILTER Liquid transfer system eliminates costly pump troubles, and simply and smoothly transfers the liquid from the low side accumulator to the high side receiver. It does this by equalizing the pressure conditions under which the pump must work. Because there is practically no pressure difference for the pump to overcome, most pump troubles are eliminated.



Vilter system for transferring refrigerating liquids.

Briefly, this is how the Vilter system works: The accumulator separates the entrained liquid from the suction gas. Then this liquid drains by gravity to another tank which Vilter calls a liquid transfer drum. After the liquid reaches a certain level, the transfer drum is isolated from the low pressure accumulator and connected to the high pressure receiver by means of valves.

After the high pressure in the receiver has equalized on the liquid in the transfer drum, the pump starts and instead of having to pump liquid from a pressure area of, say 25 psi to one of 185 psi, the pump works under equal pressures; that is, the liquid in the drum is under 185 lb pressure just as is the liquid in the receiver.

PRESS BRIEFS

Minute Maid Offers Stock to Public

MINUTE MAID Corporation plans to offer 400,000 shares of common stock to the public soon, according to Jon M. Fox, president. This financing is required to take care of the company's expanding volume of business, he said. Earnings for the fiscal year ending on October 31 were conservatively estimated at $2.35 a common share on sales of $106,000,000, Mr. Fox noted. This compares with 58 cents a share on a sales volume of $37,000,000 for the preceding fiscal year. Mr. Fox said that the company's board of directors has decided to apply for listing of the company's common stock on the New York Stock Exchange in the near future. The favorable result[illegible] year can be attributed not only to increased revenues from the company's Snow Crop division, acquired late in 1954, but also to a substantial rise in sales of products under the Minute Maid brand name, Mr. Fox said.

Supreme Court Reverses Carbonic Disposal Ruling

THE SUPREME COURT has reversed a ruling by a lower court which had ordered the Liquid Carbonic Corp. to dispose of some of its properties. The case grew out of a Consent Decree into which the corporation had entered as a result of an anti-trust case over the manufacture of dry ice. As part of the Consent Decree a trustee named by the court was to negotiate the disposal of the properties but he failed to do so within the appointed time, whereupon the District Court ordered the corporation to take the action. The Supreme Court decided the case without handing down any written decision and remanded it to a lower court for a hearing on the modification of the Consent Decree.

Citrus Plant Adds Precooler

THE LINDSAY Cooperative Citrus Association, Lindsay, Calif., plans to install a precooler adjacent to the Sunkist packing house on Oxford Avenue. When completed next year the precooling system will be housed in a building approximately 160 × 60 feet with a 25 car storage capacity.

Kansas Cold Storage Buys Hutchinson Plant

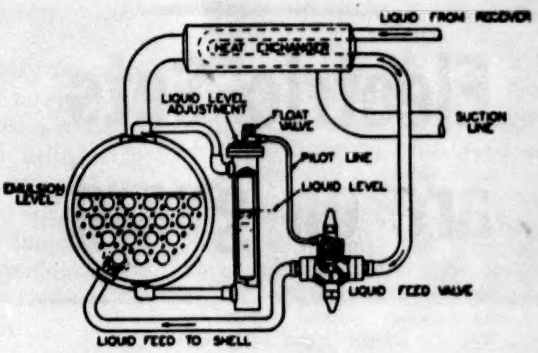
KANSAS Cold Storage, Inc., Wichita, has purchased the Carey Ice & Cold Storage Co., Hutchinson, Kansas, Cy Crossette, with 25 years of warehousing and ice experience, will be the manager. John Bear, president of Kansas Cold Storage said the acquired plant will be a distribution warehouse for the State of Kansas and that part of its 100 ton ice capacity will be converted to freezer space. NARW Cold Facts.

Air Conditioning of New York Subways Delayed

SUBWAY riders in New York must wait at least until 1957, not this next summer, before any underground trains are air conditioned. Tests during the past month turned up too many mechanical "bugs", the transit authority said, and further tests will delay the air conditioning program for at least two more years.

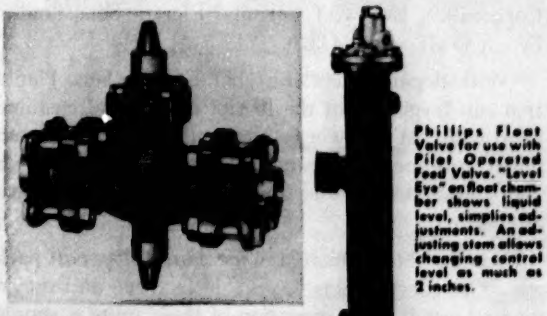
MODULATING-TYPE PHILLIPS VALVES INCREASE REFRIGERATION EFFICIENCY

A line of refrigerant valves that permit higher heat transfer rates and more stable operation of refrigeration systems has been developed by H. A. Phillips & Co., Chicago. The valves are the modulating type which automatically and continuously adjust the refrigerant flow to the refrigeration load. According to Phillips engineers, modulated refrigerant feed keeps evaporator tubes constantly wetted, insuring maximum heat transfer at all times. "Hunting" of system pressures and temperatures, a common occurrence with "off-on" refrigerant control, is also eliminated. Loading on compressors is more even, reducing maintenance problems. Phillips modulating controls include float valves for high and low side installation and both thermostatic and float pilot operated feed valves. They are applicable to a wide range of refrigeration systems.



LOW SIDE CONTROL

A typical low side method of Freon level control using Phillips Valves. Arrangement balances weight of liquid in float chamber with liquid and gas in evaporator. Float Valve at left controls high capacity Pilot Operated Feed Valve.



Phillips Float Valve for use with Pilot Operated Feed Valve. "Level Eye" on float chamber shows liquid level, simplies adjustments. An adjusting stem allows changing control level as much as 2 inches.

Phillips Refrigerant Feed Valves for both low and high side use are available from ½ to 5-in. pipe size for all refrigerants.

Write for full details and typical hook-up drawings.

PHILLIPS

H. A. PHILLIPS & CO.
DESIGNERS AND ENGINEERS
REFRIGERATION CONTROL SYSTEMS
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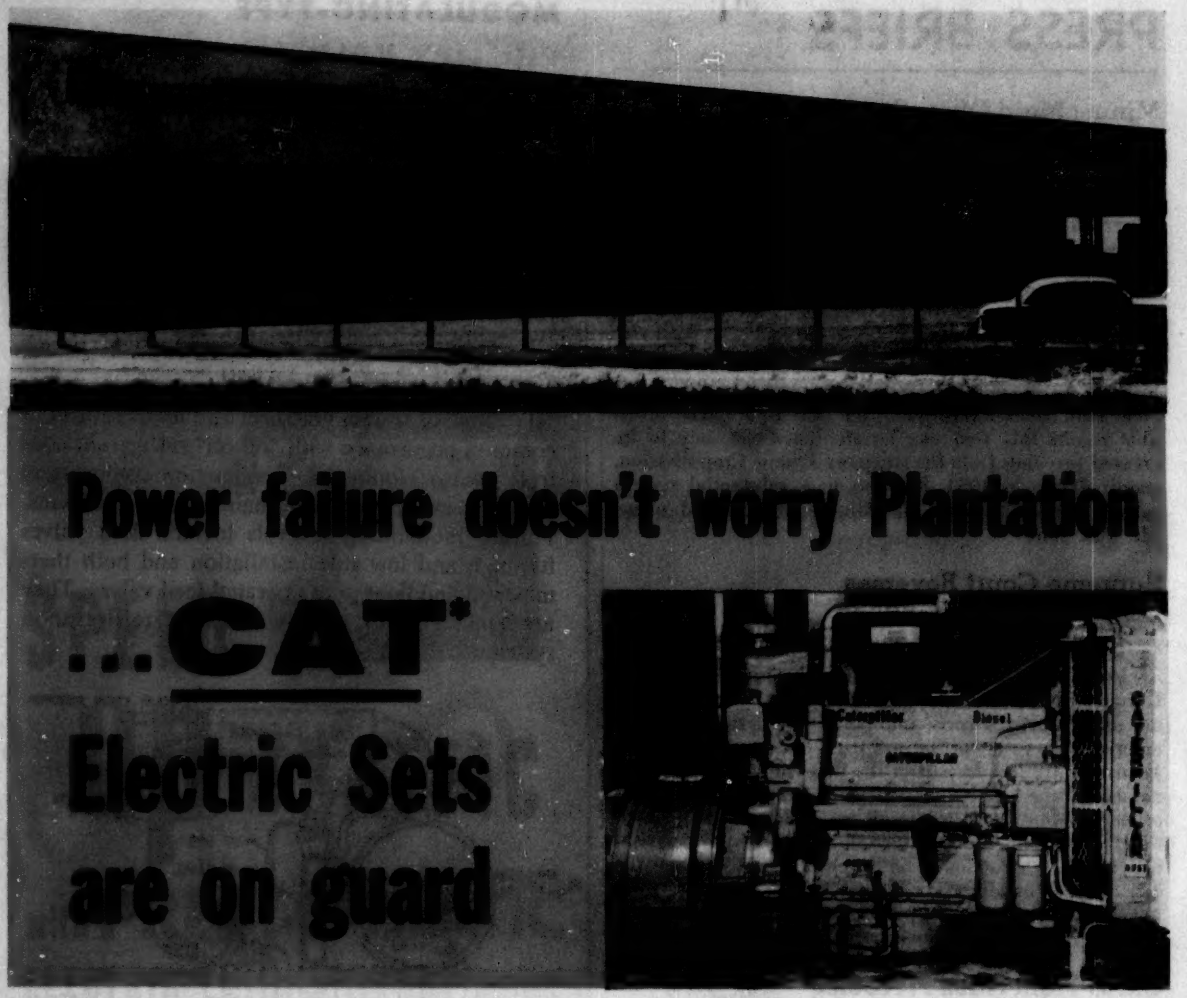

Power failure doesn't worry Plantation

...CAT* Electric Sets are on guard

A power failure, no matter what its cause, can be disastrous to a cold storage plant. That's why Plantation Cold Storage of Uleta, Fla., owned by Plantation Foods Corporation, has two Caterpillar Electric Sets standing by—a D337 and a D326.

With dependable Caterpillar Electric Sets, Plantation can forget about the loss of money and customer good will that a power failure could cause. Such sets, when equipped with automatic starting, spring into action immediately, and they will do so without human attention.

You get this protection in a compact, low-cost package. Cat Electric Sets require little space and they're easy to install. The operation of these units is simple. They require neither complicated switch gear nor a trained electrician.

There are 12 sizes of Caterpillar Electric Sets up to 300 KW. There is a size that fits your needs exactly.

Your Caterpillar Dealer knows electric sets. He will make complete installation for you or, if you wish, show you how to do it. And he'll furnish prompt, reliable service.

See him today. You can afford a Caterpillar Electric Set if you can't afford loss.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

In the Spotlight

ANTIQUATED, and even some modern, refrigerating systems, either through design or poor operating practice often jeopardize the best safety intentions. High on the list of such machinery derangements are those caused by liquid carry-over. There are a number of measures for preventing this mal-operation. Many are not familiar with the currently popular systems of "liquid-return" — so-called, because liquid trapped out of the suction (low-side) is returned to the high-side of the system. These methods of by-passing dangerous non-compressible liquid around the compressor are described in the article starting on page 13.

REPORT OF THE International Congress of Refrigeration, held in Paris August 31-September 15 is concluded in this issue, page 22. In this installment, papers on various phases of technical refrigeration activities are summarized, including Capacitance Resistance Hygrometer, cold storage of food and poultry, Evaporative Condenser design, fish freezing, refrigeration for cheese, control of relative humidity, and others.

EARLY IN 1955, San Francisco chapter, NAPRE, inaugurated a series of short talks as a part of their educational programs. The idea of short talks was not new or unique, but the idea of a member presenting a concise description of his plant or one facility in it as general information for beginning engineers, certainly was. On page 32 functions of the ice cream hardening room other than what the name implies, are described. Room construction comes in for heavy emphasis.

AN INDUSTRIAL membership classification was established by the National Association Practical Refrigerating Engineers at the Annual Convention in Los Angeles, thereby enlarging the scope of the association, by which it is expected new members will be attracted. Officers were elected and routine convention and association business was transacted. For summarized report of the meeting see Page 40.

WITH A FEW of the larger meat packers expanding or establishing new branch operations in preference to large centralized metropolitan activity, the thought occurs as to what does the small modern slaughter house look like, and what sort of a refrigeration plant does it utilize. On page 44, appears a story of the Sioux City Dressed Beef, Inc. plant. This establishment has twice increased its modern automatic refrigeration facilities in less than 18 months.

A MEXICAN Ammonia plant at Ciutitlan is a large producer of ammonia sulphate and superphosphate, used for fertilizer. Brief description and pictures of the plant are included in the article on page 46.

INSULATION in the far North is necessary to prevent building heat from reaching the permofrost layer of the ground underneath. How this was accomplished in the case of an air force base building at Thule, Greenland, is told in story on page 47.

MORE BULK ICE being used than ever! Detroit alone has 175 ice vending machines, besides facilities to satisfy industrial, retail and refreshment demands.

THE COUNTRY'S supply of railroad refrigerator cars is 125,695. According to the latest figures of the United States Department of Agriculture of this number, something over 1,000 are mechanically refrigerated, leaving more than 99 percent cooled with ice.

NINE YEARS AGO less than ten percent of the U.S. shrimp catch was frozen. Now well over half of the 200 million pounds caught per year is frozen. Practically all of the Texas catch according to the United States Department of Agriculture, goes to the freezer.

THE IMPORT of frozen meat from Holland has begun with a shipment of fourteen tons to Barcelona recently. A similar shipment will be made every other day.

Solar Heat Plant

A SOVIET design for a fantastically large sun power machine to heat and cool a city of about 17,000 population was reported to the World Symposium on Applied Solar Energy at Phoenix, Ariz. The machine, still in the paper stage, would utilize more than an acre of mirrors on slowly moving railroad cars to focus the sun's heat on a water tank atop a 135-foot tower to produce steam for power.

The solar heat hitting this tank would produce during each working hour thirteen tons of superheated steam at 330 degrees. The steam would heat houses, or cool them or produce power to pump water for irrigation.

LETTERS

(Letters to the editor are welcome from readers of INDUSTRIAL REFRIGERATION on any subject of general interest.)

Basic Controls Interesting

I have found the discussion on "Basic Electrical Controls for Refrigeration Systems" very interesting and informative (Industrial Refrigeration, July and August).

MILTON WORKMAN
Purdue University
Agricultural Experiment Station
Lafayette, Ind.

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DOUBLE PIPE EQUIPMENT is available in two types; EXCHANGERS for cooling with water, brine, and cold filtrate, and for heating with steam or hot liquids; and CHILLERS, for use with volatile refrigerants such as ammonia, propane, and Freon. Both types have 8" jacket pipes and 6" inner pipes with scrapers.

SHELL AND PIPE TYPE UNITS are designed for use with volatile refrigerants and for heating fluids with steam or similar heating mediums. They consist of large welded shells each containing seven 6" scraped pipe sections.

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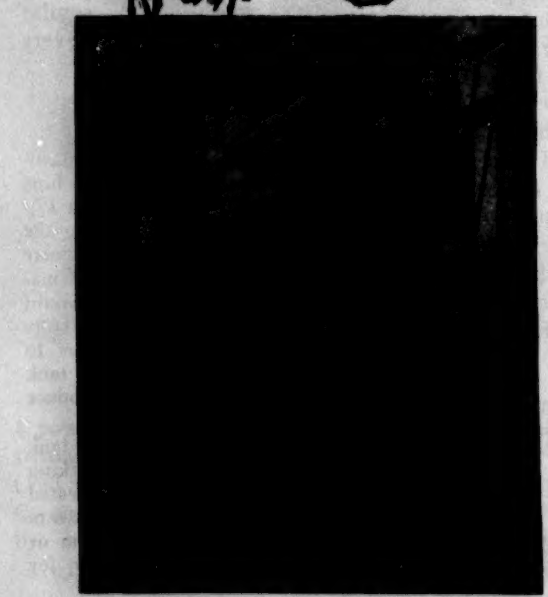
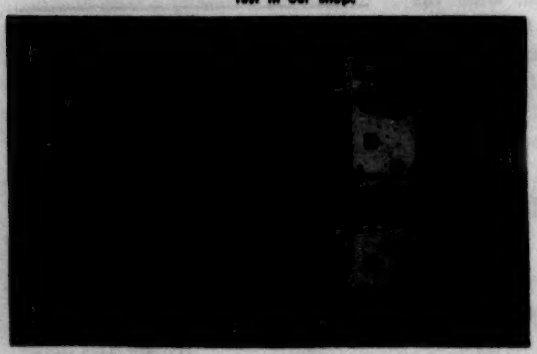


*DOUBLE PIPE UNIT. Drive end close-up of 12 section unit under test in our shop.



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Ammonia Liquid-Return Systems

W. F. STOECKER
Mechanical Engineering Dept.
University of Illinois

Featured last month in Industrial Refrigeration was an article by this author on liquid ammonia recirculation. One intention of the writer, in addition to describing the various methods employed, is to clarify for the plant owner or operator, the principal differences between "liquid recirculating" and "liquid return".

This article presents a summary of methods by which the liquid that unavoidably bubbles out of the evaporator into the suction line may be removed from the suction gas and transferred harmlessly to the high-side of the system. Liquid carry-over can sometimes be prevented by careful design or operation, so some of the reasons why liquid becomes entrained in the suction gas and procedures in minimizing liquid carry-over are discussed also.

WARM cheese from the presses was being trucked into the cold storage room. The temperature in the room rose sharply, forcing the float-operated coils to near-capacity performance. The steady click of the compressor suddenly turned to a heavy thump and the operator realized that the suction gas was sweeping liquid back to the compressor. Before he could reach the machine to throttle the suction gas, a suction valve broke with a sharp snap and the compressor idled uselessly.

The damage was done, but it could have been worse. In this case, the operator just switched the load over to another compressor and the damaged machine was repaired. In an extreme case, liquid trapped in the cylinder of the compressor could blow the head off the compressor, damage the machine room and injure employees. (See Fig. 1 and 2 for typical examples of liquid damage.)

What Causes Liquid Carry-Over?

Imposing a sudden load on the evaporators, as happened in the cheese house mentioned above, is one common cause of liquid slugs carrying out into the suction lines. Moving warm products into a cold storage room or sending warm brine into a liquid chiller delivers huge quantities of heat to the ammonia. The ammonia in the evaporator boils violently and the gas percolates liquid out of the evaporator.

When starting up a warm system, rapid boiling results because at high suction pressures the compressor is able to pump large volumes of gas. Also, when an additional compressor comes on the line, the sudden increase in pumping capacity may bubble some liquid into the suction line.

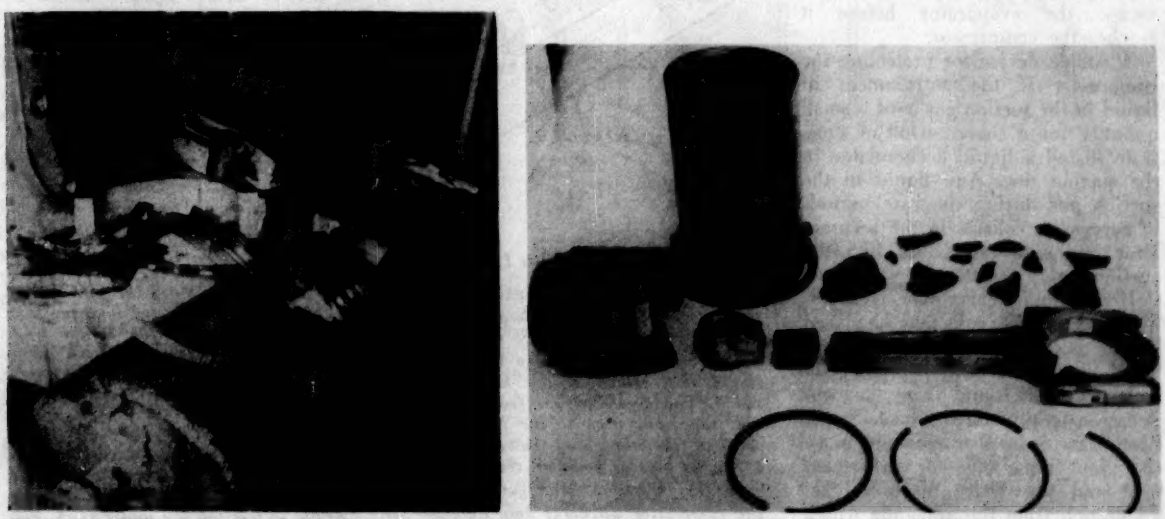
Expansion valves sometimes fail to control the level of the liquid in the evaporator. If the seats of the expansion valves become wiredrawn, the valves may allow some liquid to flood out into the suction line.

When a plant uses the hot-gas method of defrosting the evaporator, there is always a hazard at the instant that the operator switches back to refrigeration operation. If the valves are not changed carefully after defrost, the liquid in the evaporator may boil violently. When this happens, some liquid may foam out of the evaporator into the suction line. Defrosting by warm air or water also presents hazards because the evaporator is warmed in these defrost systems too.

Damages Compressors

When liquid is drawn into the compressor, it may become pocketed in the cylinder at top-dead-center of the piston stroke. Damage which may result to the compressor includes broken valves and connecting rods, and collapsed pistons. The head of the compressor may rupture if the compressor does not have lifting safety heads. Even if no immediate destruction occurs, excessive wear may be caused by the liquid washing the lubricating oil film off the cylinder walls.

In slow-speed compressors, liquid is not as likely to cause the dramatic physical damage that it will in high-speed machines. The reason is that the slow-speed machine compresses the gas at a rate which is slow enough to give the heat in the compressed



Figs. 1 and 2 — Damaged compressors and moving parts, the result of liquid "slugging." Damage of this nature not only is costly due to damage, "down time," and repairs, but may at times take a human life. "The Locomotive"

gas sufficient time to evaporate the droplets of liquid. In a high-speed machine, the time available during compression is insufficient for the heat transfer between the superheated gas and the droplets of liquid to take place. In a 1200 rpm machine, for example, compression takes place in one-fortieth of a second.

Prevention of Entrainment

Sometimes the carry-over of liquid to the compressor may be prevented by less-expensive means than liquid-return systems. Changes in operating procedure or modifications of equipment can sometimes solve the problem if the quantity of liquid carried out of the evaporator is not excessive.

One method of preventing entrainment is simply to keep the liquid in the evaporator at a lower level. The net result of this practice is, however, to reduce the effectiveness of the evaporator. As the ammonia vapor disengages from the liquid and continues through the evaporator passages, the vapor becomes superheated. In the portion of the evaporator where superheating occurs, very little heat is transferred.

Another way of preventing liquid from slopping out of the evaporator is to provide a surge drum at each evaporator to permit separation of the liquid from the gas. This method is economical if the plant has only a few evaporators. If there are many evaporators, a large surge drum on each evaporator becomes expensive.

Evaporation of Carry-Over

Since our ultimate aim is to protect the compressor, the solution to the liquid carry-over problem may be to evaporate any liquid which does escape the evaporator before it reaches the compressor.

A simple device for protecting the compressor if the entrainment of liquid in the suction gas is of a small quantity for a short period of time, is to install a liquid accumulator in the suction line. Any liquid in the suction gas during the rare periods of carry-over collects in the accumulator and slowly boils off into the suction line.

If the liquid carry-over is a frequent occurrence, coils may be placed in the accumulator to supply heat which boils the liquid off. Steam coils or warm liquid from the condenser may provide the heat. Steam heaters result in poor economy, since the plant must pay for the steam heat and yet derive no useful refrigeration from the ammonia which the steam evaporates. Boiling the ammonia in the accumulator with the warm liquid from the condenser is efficient, although often the evaporation is not fast enough to keep the liquid level to a safe point in the accumulator.

Liquid-Return Systems

If slugging of the compressor can be prevented in no other way, some form of liquid-return system must be used. Liquid-return systems automatically separate liquid from the suction gas in a suction-line accumulator and return the liquid to the high-side either by pumping or draining.

Liquid-return systems fit, generally, into one of five methods: 1) the dump trap; 2) the pressure lift; 3) the mechanical pump working against full pressure; 4) the mechanical pump with equalized pressure; and 5) the injector lift. These five methods will be discussed individually.

Dump Trap Method

When the accumulator is near the high-pressure receiver and has a higher elevation than the receiver, the dump trap system is usually the simplest and most satisfactory. By automatic action of valves, liquid drains from the accumulator to an intermediate vessel or liquid trap during the drain portion of the cycle. During the dumping action, the liquid flows from the intermediate vessel to the receiver.

One arrangement of valves for operation of the dump trap system is used by H. A. Phillips & Co. and is shown in Fig. 3. The dump trap system illustrated, uses a three-way valve to alternately vent to the suction line

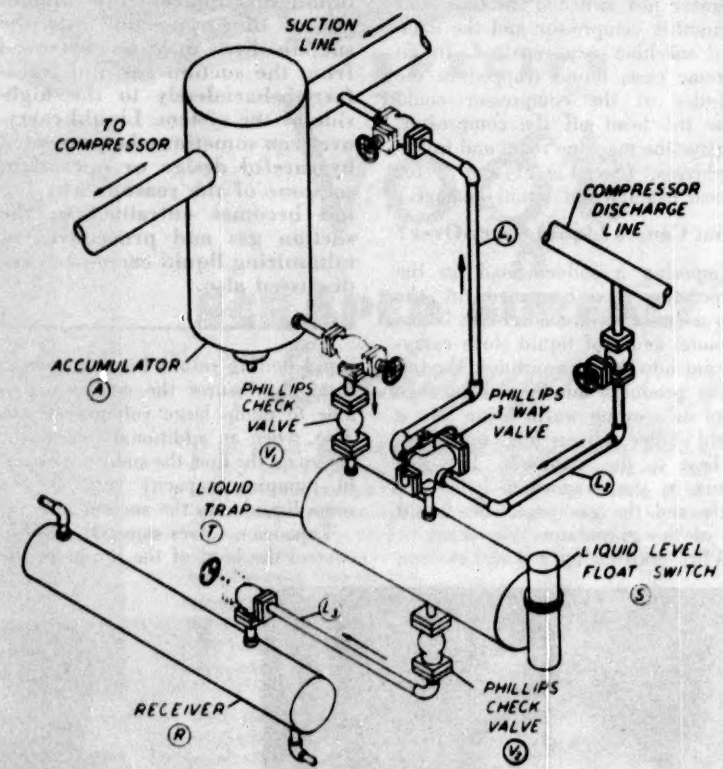


Fig. 3. Phillips Liquid Return System "A"—Gravity Feed.

Liquid in the suction gas drops to the bottom of the accumulator and during the drain-portion of the cycle pours down through Check Valve V_1 into the liquid trap which is the intermediate vessel. The displaced gas from the liquid trap vents back to the suction line through the three-way valve and line L_2. In its present position, the three-way valve has closed off the gas line from the compressor discharge line L_1.

When the level of liquid in the liquid trap rises to a pre-set point, the liquid level float switch shifts the position of the three-way valve so that high pressure gas is impressed on the liquid trap. Check Valve V_1 closes and Check Valve V_2 opens to drain the liquid in the liquid trap into the receiver.

When the liquid level in the liquid trap drops to a certain point, the three-way valve shifts again to the position which allows draining from the accumulator.

(This system for use under U. S. Patents 2570979, 2589859, 2641281 and other foreign patents.)

Fig. 4. A gravity-feed dump trap installed by H. A. Phillips & Company in an ice cream plant. The booster compressor is on the left and the high-stage machine on the right. The accumulator is at the top-center of the picture in the background. The liquid trap is the horizontal vessel in the center of the picture partially concealed by the intercooler. The receiver is in the background near the floor.

and pass high-pressure gas to the liquid trap. Separate vent and high-pressure gas lines with individual solenoid valves could be substituted for the three-way valve assembly. Fig. 4 shows a gravity-feed system which is installed in an ice cream plant.

The dump trap may take about ten minutes to complete a cycle of operation. If the liquid trap is too small, the valves will be forced to operate too often which will increase maintenance costs. On the other hand, if the liquid trap is very large, extra accumulator space will be needed to hold the liquid which collects while the trap is dumping.

For the dump trap to work properly, a certain minimum difference in elevation is necessary between the accumulator and the receiver. The difference in elevation is required because the intermediate vessel must be lower than the accumulator and the receiver must be below the intermediate vessel. Space must also be allowed for installing the valves. Usually about four feet is the minimum difference in elevation between the bottom of the accumulator and the top of the receiver which allows satisfactory functioning of the dump trap.

Pressure Lift Method

When the high-pressure receiver is located some distance from the accumulator or the difference in elevation between the accumulator and the high-pressure receiver is inadequate for good draining, the gravity-flow dump trap will not function properly and a more positive method of transferring the liquid must be used.

One such method is the "pressure lift" where the difference between the low- and high-side pressures, pumps liquid from the accumulator to an intermediate receiver. The liquid subsequently drains from the intermediate receiver to the high-pressure receiver.

Fig. 5 shows a pressure lift arrangement and describes its operation. The lift in feet that is possible with this system is determined by the static head against which the difference in discharge suction pressures can work. For example, with a 160 psig discharge pressure and a 30 psig suction pressure, the lift possible would ideally be about 480 feet. Actually, the maximum lift is much less in order to get adequate flow.

Certain features of this system are covered by patents of H. A. Phillips & Co. and the Vilter Manufacturing Co.

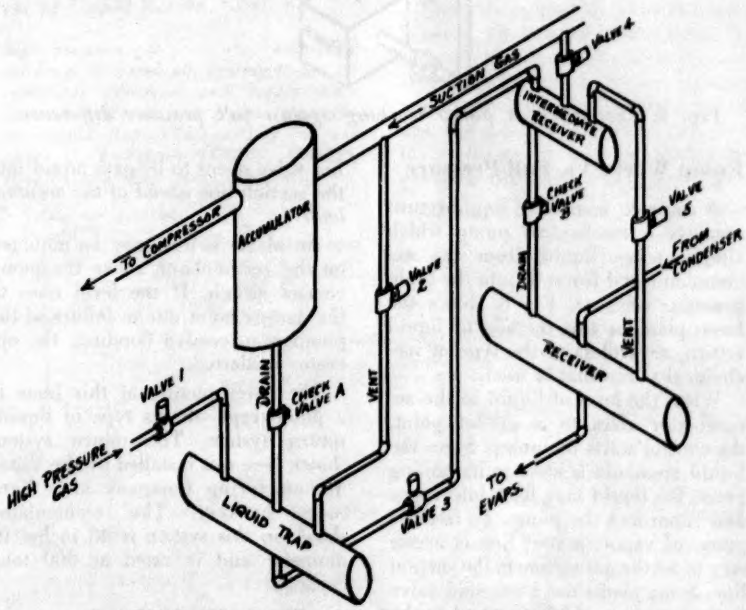


Fig. 5. The Pressure Lift System of Liquid Return.

While liquid is draining from the accumulator to the liquid trap, Valves 2 and 5 are open, and Valves 1 and 3 and 4 are closed. Liquid from the accumulator drains down through Check Valve A.

When the level in the liquid trap rises to the control point, Valves 2 and 5 close, and Valves 1, 3 and 4 open. Both Check Valves A and B close. The high pressure gas rushing in through Valve 1 builds up the pressure in the liquid trap so that it forces the liquid which has collected in the liquid trap through Valve 3 into the intermediate receiver. Because Valve 4 is open, the intermediate receiver is at the suction pressure.

When most of the liquid has been forced out of the liquid trap and the level drops to a control point, the valves revert back to their original position. Liquid once again drains from the accumulator to the liquid trap, and the liquid which was pumped into the intermediate receiver now drains down through Check Valve B into the high pressure receiver.

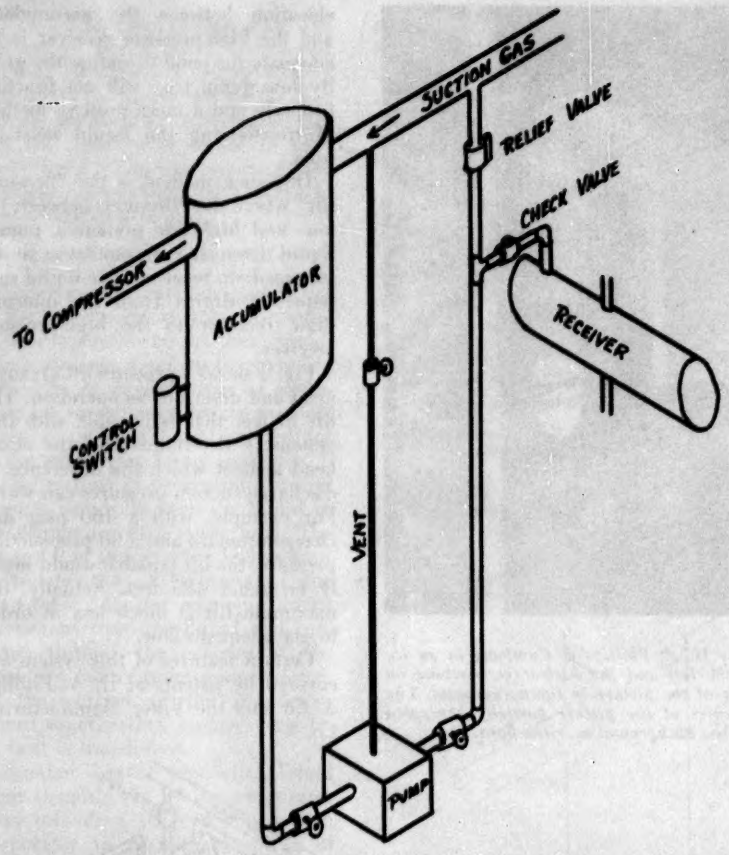


Fig. 6. Liquid-return pump working against full pressure differences.

Pump Works Vs. Full Pressure

A common method of liquid-return employs a mechanical pump which simply takes liquid from the accumulator and forces it into the high-pressure receiver. Fig 6 shows the basic plan for this method of liquid return, regardless of the type of mechanical pump that is used.

When the level of liquid in the accumulator rises to a pre-set point, the control starts the pump. Since the liquid ammonia is close to its boiling point, the liquid may flash into vapor and vapor-lock the pump. To free the pump of vapor, a vent line is necessary to let the gas escape to the suction line. Some plants use a solenoid valve in the vent line which opens when the pump is shut off and closes when the pump is operating. By so doing, the pump is always filled with liquid and stays cold which minimizes flashing during operation of the pump.

If an obstruction should occur in one of the pump lines, the pump motor may overload. To prevent this, a relief valve is placed in a line connecting the pump discharge and the suction line. If the pressure differential against which the pump is working becomes excessive, the relief valve opens to by-pass liquid into the suction line *ahead of the accumulator.*

An alarm switch may be mounted on the accumulator above the pump control switch. If the level rises to the danger point due to failure of the pump or excessive flooding, the operator is alerted.

The cover picture of this issue is a photograph of this type of liquid-return system. The return system shown here was installed by the Vilter Manufacturing Company at a Kentucky brewery. The accumulator shown in this system is 48 inches in diameter and is rated at 600 tons capacity.

Flashing Liquid at the Pump

Perhaps one of the most vexing problems encountered when operating mechanical pumps with liquid near its boiling point is flashing of the liquid into vapor. Flashing not only makes objectionable noise which may be transmitted throughout the piping system, but flashing also reduces the capacity and efficiency of the pump. Flashing of liquid may completely vapor-lock the pump. Liquid may flash into vapor because of turbulence and eddy currents or sudden increases in velocity—all of which cause localized regions of low pressure.

Special precautions must be taken in the design and installation of the pump system to eliminate or minimize flashing. All manufacturers and installers of mechanical pumps insist upon a high liquid leg on the suction side of the pump. *A suction liquid leg of eight feet is recommended,* although this height may sometimes be as low as six feet if the suction pipe is made especially large. The effect of the liquid leg is to increase the pressure on the liquid at the pump, which renders the liquid less likely to boil.

Other precautions which are recommended to prevent regions of low pressure where boiling could occur are to make the suction line to the pump straight, if possible, or to use no more than 45-degree-angle turns. When a stop valve is located ahead of the pump, the stem should be in a horizontal rather than a vertical position. When the stem is in a vertical position, gas may pocket behind the valve until a large quantity of gas surges into the pump*.

Equalized Pressure System

A liquid-return system which uses a mechanical pump and yet eliminates problems of flashing in the pump is the "equalized pressure system". Two versions of this system are shown in Figs 7 and 8. Fig 7 shows an equalized pressure system used by H. A. Phillips & Co., and Fig 8 a system of the Vilter Manufacturing Co. In either method, pressure from the high-side of the system comes onto the vessel from which the pump is drawing liquid. The head against which the pump works, therefore, is only that due to differences in elevation between the liquid trap and the high pressure receiver, and the friction losses in the pump lines.

The equalized pressure system, by exerting a pressure which is far above the saturation pressure on the liquid ammonia, eliminates flashing at the pump. Also, the pump does much less work than when it pumps against the full pressure difference, so the pump motor can be smaller. There is no saving in total power required for the pumping, however, since the compressor now shares some of the work of pumping the liquid.

Injector Pump System

Another system which can lift liquid from the accumulator to the receiver uses an injector-type pump.

*See Question 806, April 1949 ICE AND REFRIGERATION, page 40.

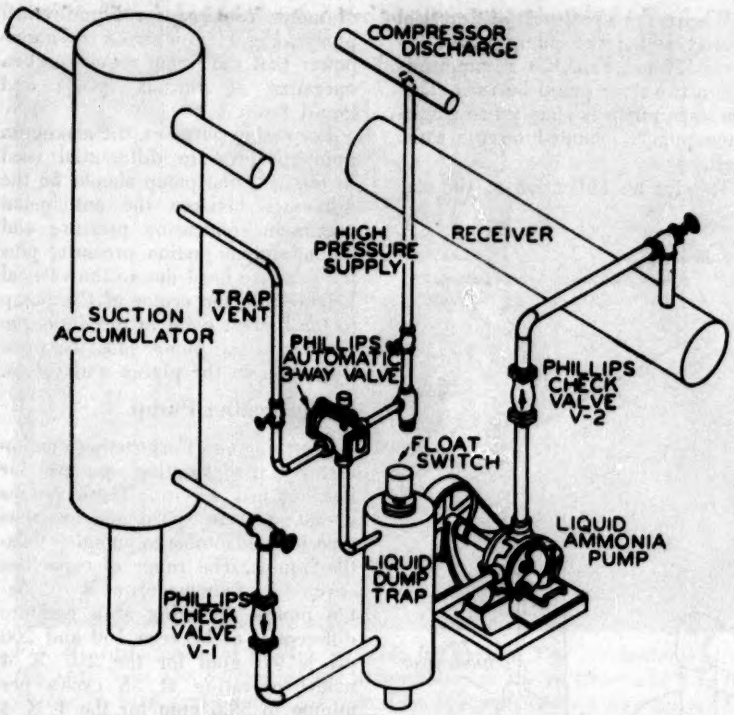


Fig. 7. Phillips Liquid Return System "G"—Trap and Pump Which Uses the Equalized Pressure System of Liquid Return.

During the draining operation, the three-way valve opens the vent line to the accumulator while liquid drains from the accumulator to the liquid trap through check valve V_1. When the liquid level rises in the liquid dump trap to the control point, the three-way valve shifts its position which applies high pressure gas from the compressor discharge to the liquid trap. The vent line is closed by the three-way valve. The controls start the pump only after full head pressure in the liquid trap has been attained. The head against which the pump works is therefore only about 5 to 20 psi caused by pipe friction plus the head due to the difference in liquid elevations between the liquid trap and the receiver.

When most of the liquid in the liquid dump trap has been pumped out, the pump shuts off, and the three-way valve shifts back to its original position. The high pressure gas from the compressor discharge is closed off, venting to the accumulator resumes, and liquid once again drains from the accumulator into the liquid trap. (This system for use under U. S. Patents 2570979, 2589859, 2641281 and other foreign patents.)

The injector pump expands high pressure gas through a nozzle to step up the velocity, then entrains the liquid which is to be pumped. A liquid-return system of this type is designed by the H. A. Phillips & Co. and is shown in Fig 9. A photograph of an operating injector lift system is shown in Fig 10.

The injector is capable of lifting the liquid about twenty feet. The injector is simple and less expensive in first cost than a mechanical pump, although it is not as efficient in operation as a mechanical pump. This method of liquid-return can be used in systems with suction pressures above 0 psig. Below that suction pressure, the injector is inefficient.

Equipment

All liquid-return systems are essentially a combination of vessels, a pump, valves and the connecting piping. The heart of the forced liquid return system is the pump. Several different types are commonly used and each has its special characteristics which should be considered when designing the system and selecting the pump. The accumulator must also be carefully designed, and basic design requirements of the accumulator will be discussed.

Gear Pumps

Some installers of liquid-return systems use a positive-displacement gear pump. Fig 11 shows some performance characteristics of a gear pump manufactured by the Frick Co. The performance curves in Fig 11 show that the capacity of the pump in pounds per minute drops off as the pressure differential increases.

Since there must be some clearance between all moving parts, some liquid will leak from the high pressure side of the pump to the low pressure region. Because of this internal leakage, the speed of the pump may have to be increased just to develop the pressure differential that is required

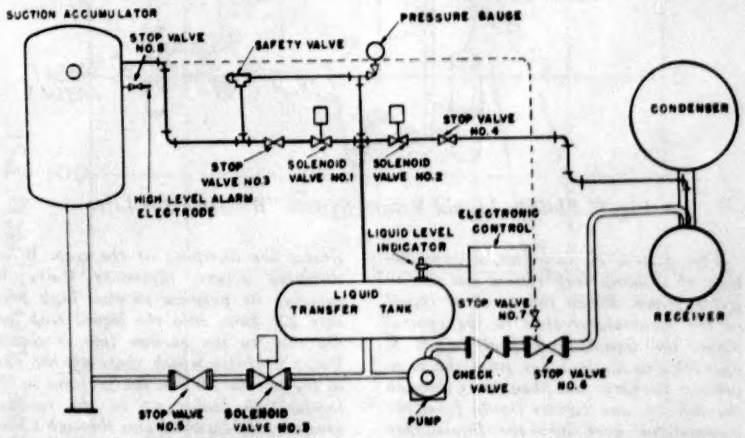


Fig. 8. The Vilter Equalized Pressure System of Liquid Return.

During the draining portion of the cycle, Solenoid Valves 1 and 3 are open. Liquid then drains through Solenoid Valve 3 from the accumulator to the liquid transfer tank and gas vents through Valve 1 to the top of the accumulator. All of the stop valves are open.

When the liquid level rises to the control point in the liquid transfer tank the electronic control is actuated and the transfer portion of the cycle begins. Solenoid Valves 1 and 3 close, Solenoid Valve 2 opens and the pump starts. High pressure gas from the receiver rushes through Solenoid Valve 2 to equalize the pressures in the liquid transfer tank and the receiver.

After the pump delivers enough liquid to the receiver to drop the liquid level in the liquid transfer tank to a predetermined level, the valves switch to their original position and the pump shuts off.

to pump from the suction pressure to the discharge pressure refrigeration system. The flow that is thus delivered may be greater than actually required, but the increased flow would merely allow a faster transfer of liquid from the accumulator to the high-pressure receiver.

When the pressure differential against which the pump works exceeds 150 psi, Frick Co. recommends that a two-stage pump be used. This two-stage pump is simply two single-stage pumps mounted on the same shaft.

To give an indication of the size of motor required for liquid-return pumps, Fig 11 also shows the horsepower that the pump requires when operating at various speeds and liquid flows.

For design purposes, the maximum pumping pressure differential used in selecting the pump should be the difference between the anticipated maximum condensing pressure and the minimum suction pressure, plus the pressure head due to the vertical height from the center of the pump to the highest point in the discharge line above the pump, plus the pressure drop in the piping and valves.

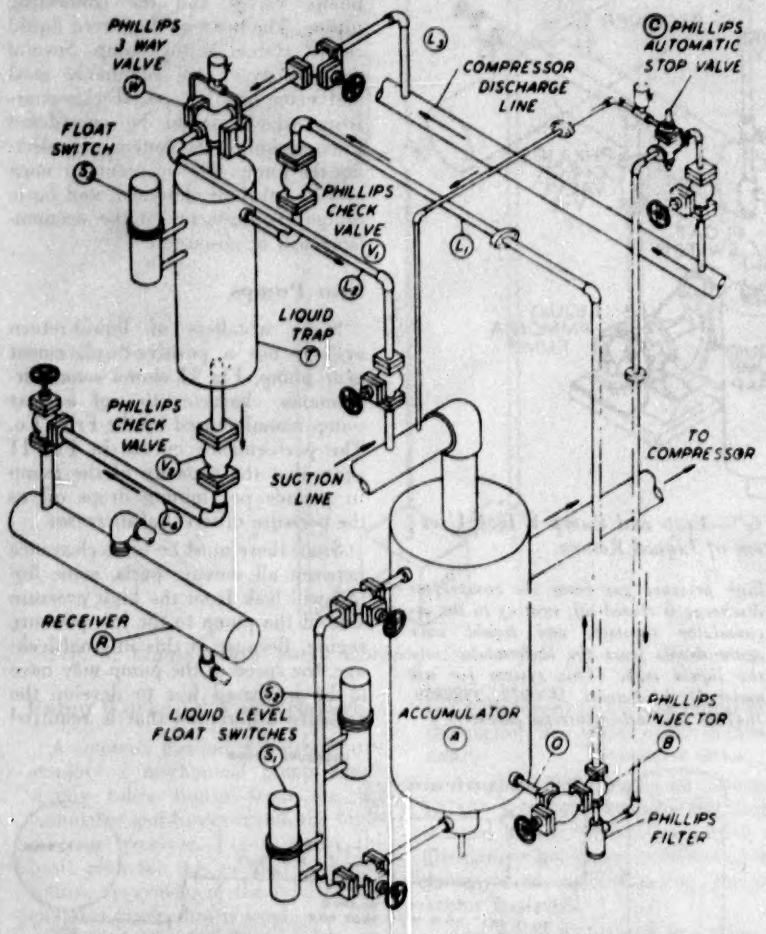


Fig. 9. Phillips Liquid Return System "B"—Injector Lift.

This system is, in effect, a combination of a dump trap system and an injector pump. When the level of liquid in the accumulator rises to the control point, the liquid level float switch S_2 opens Valve C. Hot gas from the compressor discharge line then flows through the injector and carries liquid from the accumulator over into the liquid trap which is at suction pressure. Three-way valve W is in such a position that the gas which comes into the liquid trap vents back into the suction line.

The injector continues to pump until one of two things happen: (a) the level of liquid in the accumulator drops to the point that float switch S_2 shuts off Valve C which stops the pumping. The liquid which has been pumped over into the liquid trap will slowly evaporate and be drawn into the suction line. The usual occurrence, (b), is that the liquid trap fills to the point that float switch S_3 activates the dumping of the trap. When dumping occurs, three-way Valve W switches its position so that high pressure gas flows into the liquid trap and the vent to the suction line is closed. Valve C closes which shuts off the flow to the injector. When the pressure in the liquid trap builds up to the receiver pressure, the liquid drains through Check Valve V_2 to the receiver. After the liquid level in the liquid trap drops to a pre-determined point, three-way Valve W shifts back to the position where it is ready to allow the liquid trap to receive more liquid from the injector.

The upper float switch (S_1) on the accumulator is for activation of a high level alarm in case liquid, under abnormal conditions, fills the accumulator faster than the system is taking it out. (This system for use under U. S. patents 2570979, 2589859, 2641281 and other foreign patents.)

Reciprocating Pump

Worthington Corporation manufactures reciprocating pumps for liquid-return service. These pumps operate at slow speed and are thus especially adaptable to pumping volatile liquids. The range of capacities covered by four models of Worthington pumps operating at a pressure differential of between 150 and 200 psi is 9.5 gpm for the 2½ × 4 model operating at 35 cycles per minute to 38.6 gpm for the 4 × 4 model operating at 50 cycles per minute. The range of horsepower requirements for these conditions is 2 hp to 7½ hp. Fig 12 is a photograph of a reciprocating pump in use for liquid-return service.

Turbine Pump

Rex Engineering and Sales Company, Oklahoma City, has entered the market with a liquid pump especially designed for liquid-return systems. This pump is of the turbine type which has blades on the periphery of a rotating impeller. In a test by the manufacturer, the pump operated satisfactorily with liquid ammonia at a suction pressure of 20 inches of mercury, vacuum, and a discharge pressure as high as 250 psig.

Accumulator

The accumulator must perform two functions. It must have sufficient area for the passage of suction gas so that the velocity decreases enough to drop out the liquid. The second function of the accumulator is to provide sufficient volume for storage of the liquid so that the pump does not cycle too frequently.

To meet the first requirement of separation of the liquid from the gas, the *velocity of the gas should be limited to about* 200 *fpm*. For design calculations, the volume flow of suction gas at maximum capacity should be used, since slugging is likely to occur during periods of heavy refrigeration load. Sometimes when the

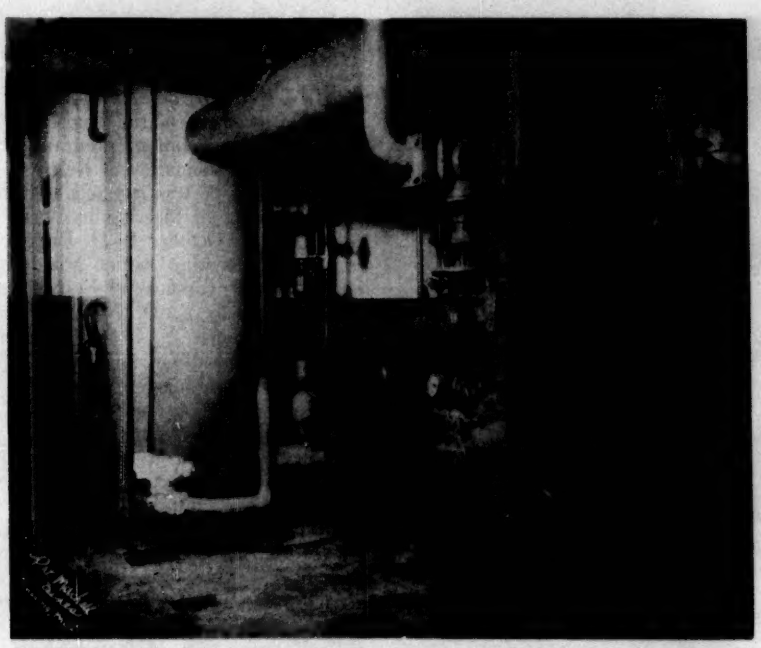


Fig. 10. Installation of Phillips injector lift system. The accumulator is on the left. Near the bottom of the accumulator is the injector which is fed by the ¾ inch vertical hot gas line. The 1¼ inch vertical line carries the liquid which is being pumped to the liquid trap. The lower float controls the hot gas supply from the compressor and the upper float is an alarm.

head room is limited, the accumulator cannot be mounted vertically but must be placed in a horizontal position. The area used in the calculation of the separation velocity is no longer the circular area of the cylinder, but the area of the segment of the circle between the liquid and the top of the shell. (See page 15, November IR).

The storage volume in the accumulator is dependent upon the individual circumstances in the plant. Most manufacturers have recommended sizes of accumulators for plants of various capacities. The volume of the accumulator may represent about 15 percent of the volume of liquid in the plant, although if the rate of liquid slop-over is high, the accumulator should be larger.

Application

Liquid-return systems are installed on both old and new plants and are found in practically every type of ammonia refrigeration plant. Sometimes liquid-return systems are installed in an existing plant which has just undergone a change in load structure which caused a slop-over problem. Liquid-return provisions are commonly used in new plants where it appears that slop-over is likely. Liquid-return systems may be seen at work in dairies, breweries, packing plants, freezing plants, cold storage warehouses and many other refrigerating establishments.

Sizing the System

Estimating the required capacity of a liquid-return system is often difficult and this usually influences the designers to be on the conservative side. The quantity of liquid carried out of the evaporator, expressed as a percentage of the amount evaporated, may be 10 percent in one plant and as much as 100 percent during abnormal operation in another. The designer usually has to rely on past experience and a knowledge of the expected operation of the plant. The storage space in the accumulator and other storage vessels often helps the system over a peak which may occur for a minute or two. Often more return capacity can be provided at little additional cost by increasing the speed of the pump.

As an example of some typical figures, in a 125 ton plant operating at 10 psig suction pressure which is being designed for 20 percent slop-over, the rate of ammonia evaporated is 53.3 lb/min. With a slop-over of 20 percent, 10.7 lb/min or 1.9 gal/min of liquid must be returned to the high-side. A safety factor should be applied to the 1.9 gpm figure to allow for unforeseen difficulties. Also, the thought must be borne in mind that the system using the pump which works against the full pressure difference is the only system which continuously returns liquid to the high-side. All of the other systems should be designed for operation on an intermittent basis. This means that the system must return in a portion of

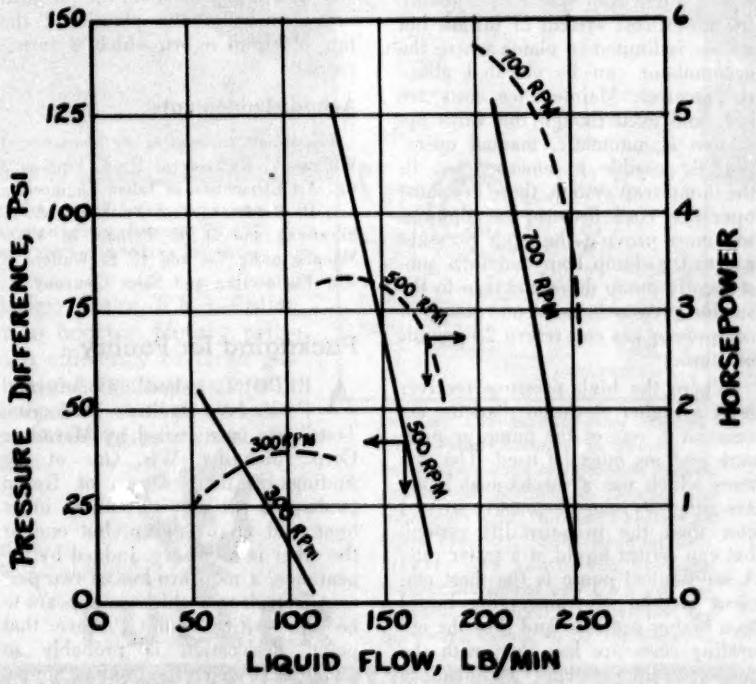


Fig. 11. Pumping pressures and power requirements of an ammonia gear pump operating at various speeds. The dashed lines represent the horsepower and the solid lines are the pressure differentials. (Data courtesy Frick Company)

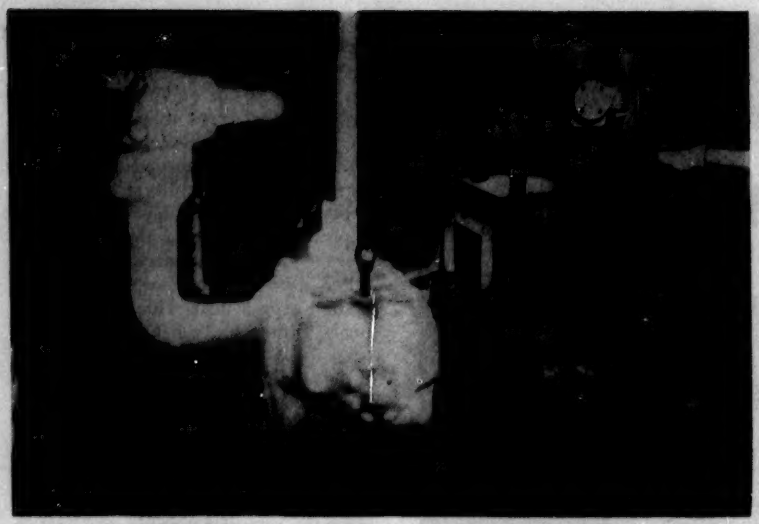


Fig. 12. Liquid-return pump of the reciprocating type. (Photo courtesy of Worthington Corporation)

the cycle all of the liquid which accumulates during the entire cycle.

In any of the return systems which use high pressure gas, the system should be designed for the lowest condensing pressure encountered during cold weather. Economical winter operation will thus not have to be sacrificed in order to operate the liquid-return system.

Costs

The dump trap system is probably the lowest-cost system to install, but its use is limited to plants where the accumulator can be elevated above the receiver. Maintenance costs are low, and even though the valve operation is automatic, manual operation is possible in emergencies. In the dump trap system, there are some operation costs because the compressor must provide the high pressure gas to the dump trap and then subsequently pump down the trap to the suction pressure. About one pound of compressor gas can return 25 pounds of liquid.

Where the high pressure receiver is at a higher elevation than the accumulator, one of the pump or pressure systems must be used. The systems which use a mechanical pump are generally more expensive in first cost than the pressure lift system, but can return liquid at a faster rate. A mechanical pump is the most efficient method of transferring liquid to a higher pressure and thus the operating costs are less than with the pressure lift system. Maintenance costs are inclined to be higher with the mechanical pump than with the systems which function solely through operation of valves.

Summary

Liquid carry-over, both in large and small quantities, is detrimental to compressors and to plant safety. In the design and operation of the refrigeration system, all precautions within good economy should be taken to prevent carry-over.

If a liquid-return system is deemed the most effective and economical method of compressor protection, the choice of the type of liquid-return system will depend upon the physical arrangement of the plant and the rate of liquid return which is anticipated.

Acknowledgements

The author appreciates the assistance of William V. Richards of H. A. Phillips & Co., Art Clementson of Julian Engineering Co., H. Reichenback of Frick Co., A. A. Silverman and D. E. Perham of Vilter Manufacturing Co. and R. E. Walters of Rex Engineering and Sales Company.

Packaging for Poultry

A REPORT called "Commercial Frozen Poultry Packaging Tests" has been issued by Marathon Corp., Menasha, Wis. One of the findings is that cartons of frozen poultry do not require both an inner liner and an overwrap, but one or the other is necessary. Judged by appearance, a moisture loss of two percent from frozen chickens appears to be the critical point. Above that point, desiccation is probably so severe as to make the product noticeably unattractive. Stan Ellis of Marathon recently said cellophane windows on frozen food packages tend to become brittle with handling.

Executive Committee NARW Fall Meeting

CONTINUED development and improvement of the Legislative and Industrial Relations program of the National Association of Refrigerated Warehouses was stressed at the Association's Fall Meeting in Washington, D. C., October 10-11. Presiding at the meeting, which was attended by all members of Executive Committee, was F. D. Newell, Jr., NARW President.

Most of the discussions centered on industrial relations and legislative matters and general association business. NARW was instructed to maintain its activities of discouraging further government competition with the warehouse industry, and to continue its policy of close liaison with all government agencies affecting the refrigerated warehouse industry.

It was pointed out at the meeting that NARW's membership is now at an all-time high—519 members. Seven new members were admitted—six regular and one associate.

The new regular members are: Arctic Ice Co., Plant City, Fla.; Berkshire Cold Storage, Chicago, Ill.; Beechwood Street Freezer Corp., Dorchester, Mass.; Hilton Packing and Storage Corp., Hilton, N. Y.; Empire Cold Storage Co., Ltd., Montreal, Canada; and Florida Warehouse Corp., Jacksonville, Fla. The new associate member is Edward M. Jones & Son, San Francisco, Calif.

Strawberry Pack Shows Record High Total

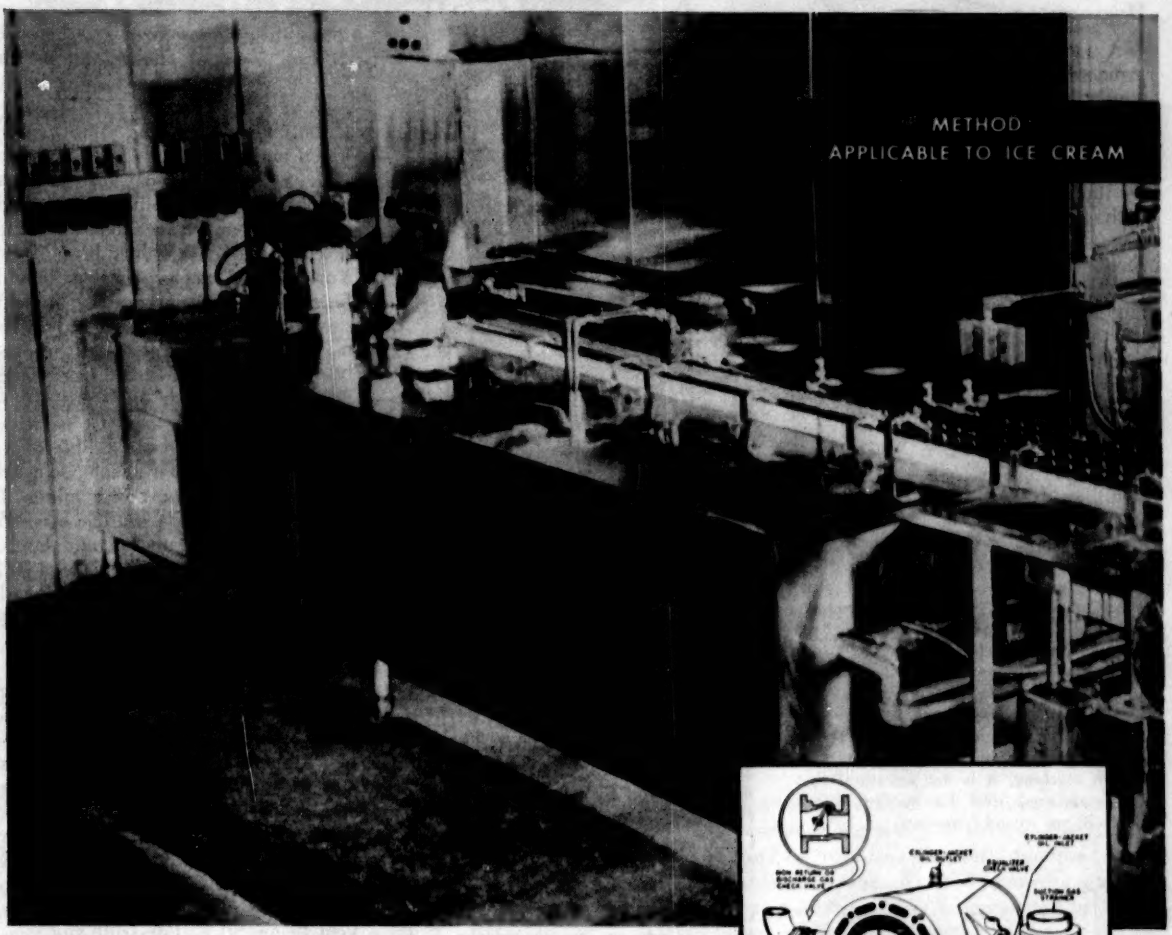
THE FROZEN food industry is going over the top in its 1955 pack of frozen strawberries with an indicated production of 260 million pounds, the highest total ever. The National Association of Frozen Food Packers, which made the survey, revealed that, exclusive of California where production is still going on, the 1955 pack is 26 million pounds greater than last year. And California's production is running some 14 percent ahead of 1954.

Biggest producing area, as usual, was the Northwest where six states, Washington, Oregon, Idaho, Utah, Montana, and Colorado, accounted for 120 million pounds, 20% above 1954.

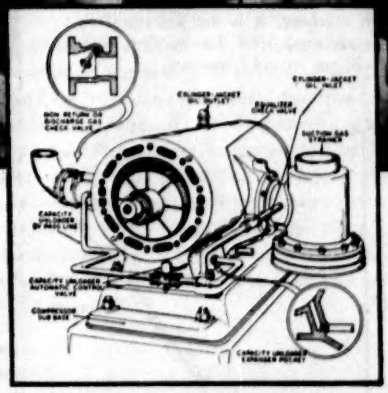
Significant is the increased trend to retail sizes. This year some 47 percent of the total pack went into containers for retail sale. As was the case last year, the familiar 10-oz. size was most important, followed by the 16-oz. package.

Continuous Freezing of Retail Cartons at Rate of 180 per Minute Requires Only One Operator

at Fairmont Canning Company, Winnebago, Minn.



Frozen food packages entering the Freezing Equipment Sales continuous freezer from high-speed filler. Compact insulated room freezes 24,690 12-oz. packages at one time. Only the product enters and leaves the room.



Fairmont Canning Company selected F E S -Fuller Rotaries to provide a flexible two stage refrigeration system capable of matching a variable refrigeration load. Fairmont's battery of Plate Frosters, loose product Belt Freezer and continuous Package Freezer are served by F E S -Fuller Rotaries under varying refrigeration requirements from 3" to 10" Hg. Vacuum.

Compactness and simplicity of design make **F E S -Fuller Rotary** the most popular refrigeration booster. Rotary principle of gas compression insures high efficiency at large gas volumes to give compact and light weight machine generally smaller than the driving motor. Absence of suction and discharge valves, connecting rods and crankshaft give a simplicity in design which guarantees low maintenance cost and quick overhaul if any plant shutdown is necessary.

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Capacitance-Resistance Hygrometer

A new capacitance-resistance hygrometer utilizing an electric condenser containing anodized aluminum oxide was described by A. C. Jason of Gr. Britain. Use is made of the fact that both the capacity and resistance of such a condenser varies with the relative humidity at ambient temperature. Figs. 12 and 13 show the variation of capacity and resistance with relative humidity, the measurements being made at a frequency of 1000 Hz[1]. Unfortunately the useful range of this hygrometer does not extend above 90 percent of relative humidity as at this range its sensibility falls off.

[1]Hz stands for Hertz and is the German unit of frequency of electromagnetic waves, 1,000 Hz meaning one kilocycle or 1,000 cycles (vibrations) per second. Hertz was a German Physicist (1830-1880), from a similar school of thought of Roentgen, and was the first to demonstrate the phenomenon of electromagnetic waves. Radio sets in Germany are still calibrated according to Kilocycles per second or Hertz of the sender station and not according to wavelengths (meters). As German science has strong influence in English teaching, it is not unnatural that Mr. Jesan used 1000 Hz instead of our Kilocycle per second frequency.

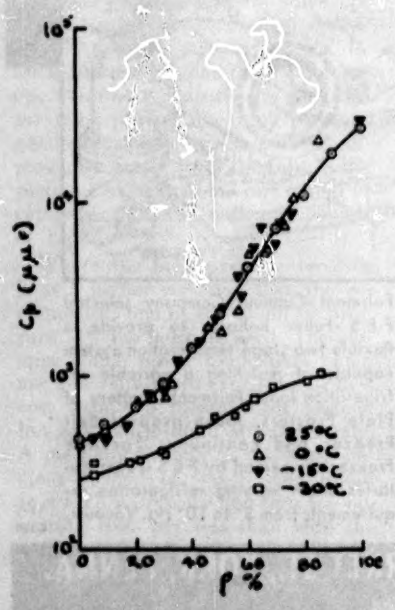

Fig. 12—Diagram showing variation of capacity with relative humidity.

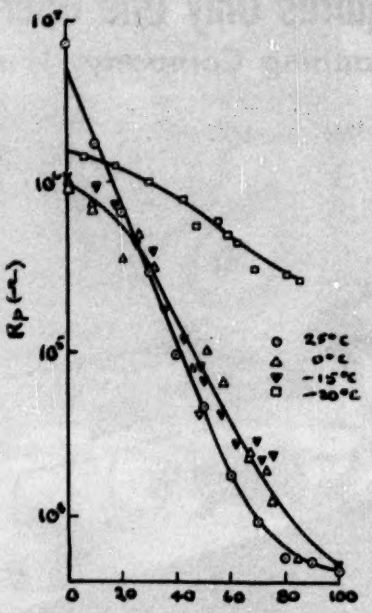

Fig. 13—Diagram showing variation of resistance with relative humidity.

Cold Storage of Food

A draft of recommended conditions for the cold storage of perishable foodstuffs were submitted by Dr. J. C. Fidler, G. Borgstrom, R. Thevenot and N. E. Holmes, after gathering data supplied by coworkers from the United States, Australia, Belgium, Canada, England, Germany, Holland, Norway and New Zealand.

Shell-eggs should be stored at 0 C for periods six weeks to six months. For periods up to six weeks 5 C could be acceptable. For whole egg or egg yolk, temperature of minus 18 C to minus 15 C is advisable. Meat, non frozen; for short term storage of meat, for 2-3 days, temperature of 4 to 7 C might be used with relative humidities of 80 to 90 percent. For medium storage, two or three weeks, the range minus 1 C to plus 1 C is recommended, together with a relative humidity of 85 to 90 percent. Long term storage, 8 to 10 weeks, is usually only possible if an inhibitor to microbical growth such as CO_2 is used. The conditions for storage are then minus 1.5 C, relative humidity 90 percent. Poultry, non-frozen; the following information based mainly on U. S. and Canadian data were recorded: for broilers which have been chilled in ice and stored in chopped ice: total shelf life three to four days. Older birds, New York dressed, not eviscerated, should be stored at 1 C. These may be held seven to 10 days. Eviscerated birds usually keep a little longer if properly prepared. Rapid chilling is important. Storage for one week. Temperature minus 2 to 0 C; relative humidity 85-95 percent. Edible offal, non frozen: very perishable. Storage temperature recommended minus 1 to 1 C. Storage life seldom exceeds seven days. Beef, mutton and lamb, frozen: temperature of minus 15 C for storage up to six months and minus 20 C for 12 months is recommended. Pork, frozen: short storage, 3 months minus 12 C; medium storage, 6 months, minus 18 C; long storage, 12 months, minus 20 to minus 24 C Poultry, frozen: short storage 3 months, minus 12 C; medium storage 6 months, minus 18 C; long storage, 12 months, minus 20 to minus 24 C Milk: cooling to 50 F in two hours after milking and to 32 F after pasteurization is recommended. Milk stored in retail shops should be kept below 50 F. For fruit and vegetables the conditions shown in table below are recommended:

Evaporative Condenser Design

P. Berliner of the Borsig Co. W. Berlin presented a paper on recent trends in evaporative condenser design in view of the advances in the science and techniques of mass, heat,

TEMPERATURES RECOMMENDED FOR FRUITS AND VEGETABLES

FRUIT	TEMPERATURE C	TEMPERATURE F	MAXIMUM PERIOD OF STORAGE	PRINCIPAL DISORDERS
Apricot	−0.5 to 0	31 to 32	1 to 2 weeks	Internal
	+6	43	up to 10 days	browning
Blackberry	−0.5 to 0	31 to 32	7 days	mould
Black currant	0	32	6 to 10 days	mould
Cherry	−0.5 to 0	32	10 days	rotting
Cucumber	10	50	10 to 12 days	mould
Fig, green	−0.5 to 0	31 to 32	7 days	
Gooseberry	−0.5 to 0	31 to 32	2 to 3 weeks	
Melon, water	4.5	40	10 to 12 days	
Mushroom	0	32	3 days	
Raspberry	−0.5 to 0	31 to 32	5 days	mould
Strawberry	−0.5 to 0	31 to 32	3 to 5 days	
Tomato, turning	12	53	2 to 3 weeks	
Tomato, ripe	10	50	7 to 10 days	

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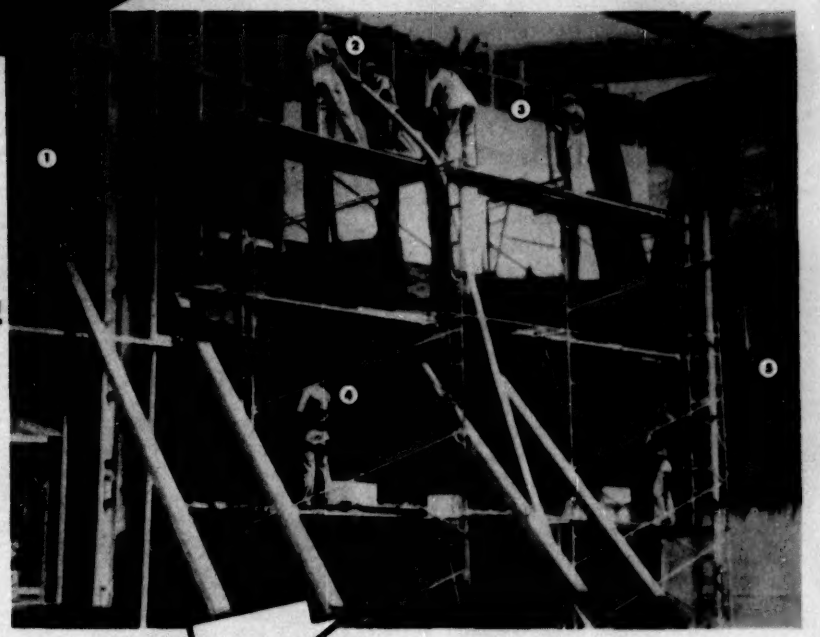

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On-the-job photo illustrates five construction steps: 1—Vapor barrier on warm side of wall. 2—*Palco Wool* being applied by void-free method (described fully in new Cold Storage Manual). 3—Temporary retainer for next course of *Palco Wool* being nailed to studs. 4—Insulation being inspected for void-free fill in wall area exposed by removal of temporary retainer. 5—Self-supporting *Palco Wool* in place. Note how temporary retainer has been removed from all but top area, while interior finish is being placed at bottom of 27 ft. wall.

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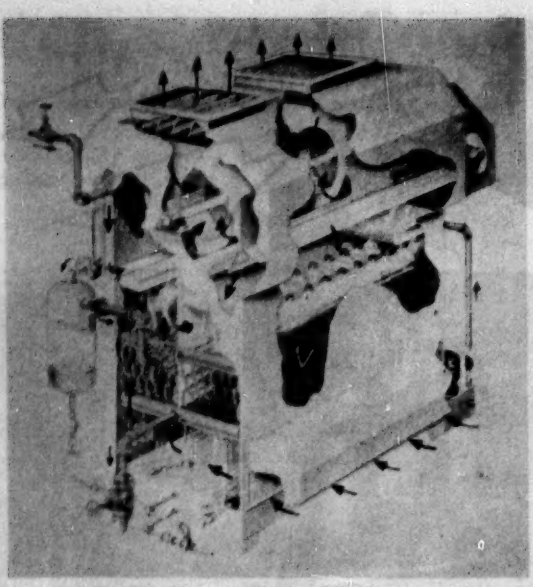

Fig. 14—Niagara Aeropass Condenser.

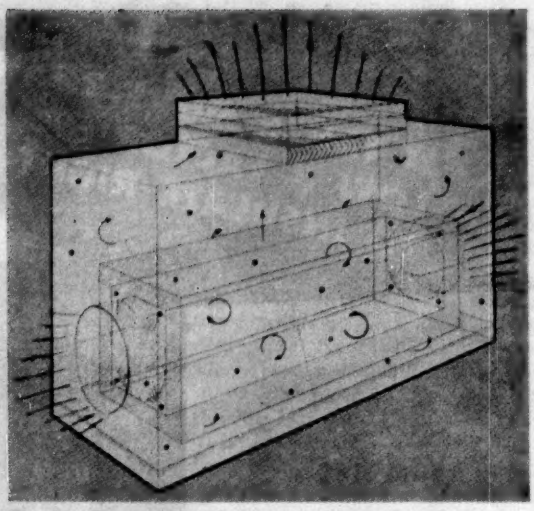

Fig. 15—Borsig Eddy Chamber Condenser, flow diagram.

and momentum transfer. The capacity of an evaporative condenser is increased with the intensity of the turbulence of the air stream on account of the efficient transfer and diffusion at the expense, however, of higher energy consumption by the blowers. The basic design question of matching of heat transfer area, induced air volume and circulating water volume is an economics problem.

The general trend leads to a reduction of the coil surface. To obtain a maximum water surface exposed to the air stream, either a small amount of water at high pressure or a large amount of water at low pressure may be sprayed by nozzles or spray disks. The formation of deposits on the coil surface is a serious factor against the use of finned coils. On the question of instrumentation and control, in case of falling condensing temperature due to reduced load or cool dry weather, the energy consumption may be diminished by installation of a pressurestat in the hot refrigerant line, cutting out or changing the speed of the pump or the fan motor.

Oil Entrained With Superheated Refrigerant

As to the question of oil entrained with superheated refrigerant, it is separated easier at low than at high temperatures. It is therefore advisable to arrange the oil separator in the refrigerant line past the desuperheating coil. The consideration set out above have led to new designs illustrated in Fig. 14 and 15.

Refrigeration Of Poultry

The influence of refrigeration in extending the storage life of poultry meat in particular, was then stressed by G. F. Stewart of University of California. The carcasses are usually chilled in air agitated ice slush. Two or three pound eviscerated broiler-fryers can be chilled to 45 F or under in just under 2 hours. They are mostly marketed in frozen condition, many wrapped in polyethylene or vinylidene-vinyl co-polymer or regenerated cellulose bags. A storage life of two to three weeks is desirable. The two most common methods are using the direct expansion multiple plate freezer. In order to obtain the attractive light surface color in the frozen turkey, it has become common to freeze the plastic film wrapped carcass in air blast tunnels at minus 30 to minus 40 F. A process using immersion in agitated propylene glycol is now being tested commercially in Canada.

Fish Freezing

The engineering aspects of fish freezing and storage were discussed by W. A. MacCallum of the Atlantic Fisheries Experimental Station, Halifax, Nova Scotia, Canada. In his experience of freezing at sea, ammonia compression systems powered by diesel generators proved very reliable. Small Freon 12 compressors operating aboard ship at positive suction pressures may prove adequate in conjunction with appropriate evaporator surfaces for chilling sea water and brine, used in the cooling and freezing premium catches, e.g. shrimp, salmon and halibut. Successful attempts were made to use sugar in calcium or sodium chloride solutions to lower the freezing temperatures.

Vertical plate freezers for use aboard ships are reported, vertical plates being simpler to operate than horizontal ones for the freezing of whole groundfish. Effective thermal contact between plates and fish was found possible without using water to fill voids. Slabs 11.4 centimeters thick were quick-frozen at evaporation temperatures of minus 35 C. The refrigerant used was Freon 12. A number of small ammonia absorption machines of 2 tons and 20 tons capacity were tried out. Performance data for the smaller one was: reflux ratio 0.68, purity of ammonia to the condenser 99.97 percent, strong liquor circulation three U.S. gpm, steam pressure from 10 to 40 psig, evaporator air temperatures from 0 to minus 29 C. Performance factors varied between 0.35 and 0.45, which is low. For a typical large, frozen fish, fish meal and liver operation, a good heat balance may be obtained when electrical requirements, provided by a back pressure steam turbo generator, are kept to a minimum, and all heat requirements including those for absorption refrigeration, are provided by rejected steam. One analysis shows the ratios of energy requirements for necessary electric power to be as follows: freezing fillets: 1.0751, holding facilities 0.645, ice manufacture 1.370, fish meal 3.000, liver oil 0.123, heating 2.560. Total 8.773. These calculations assume 100 percent utilization of equipment and that electric power for refrigeration is confined to the operation of the liquor pump and the cooling water pump.

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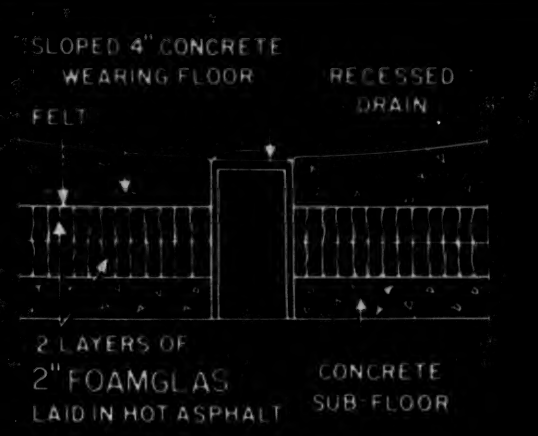
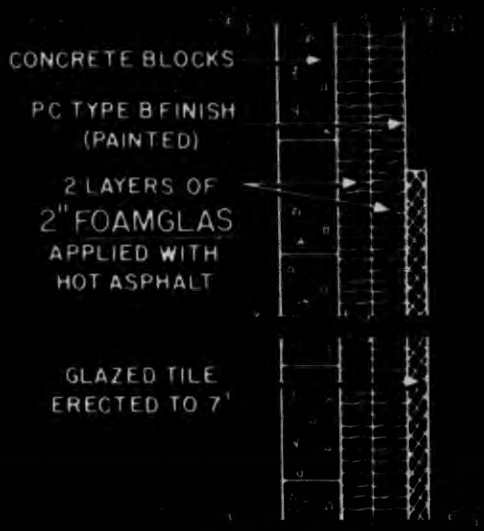
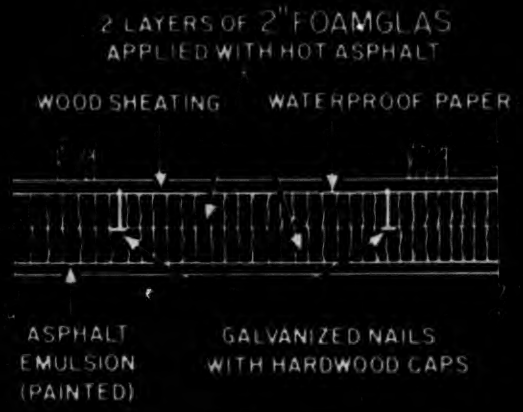


DETAIL C
TYPICAL FLOOR SECTION



DETAIL A
TYPICAL WALL SECTION


2 LAYERS OF 2" FOAMGLAS APPLIED WITH HOT ASPHALT
WOOD SHEATING
WATERPROOF PAPER
ASPHALT EMULSION (PAINTED)
GALVANIZED NAILS WITH HARDWOOD CAPS

DETAIL B
TYPICAL CEILING SECTION

"FOAMGLAS insulation proved it stays dry by stopping seepage into our cooler"

reports H. S. Moore, Bohrer & Moore Packing Company, Wapakoneta, Ohio

Use of FOAMGLAS insulation has benefited an Ohio meat packer in several unusual ways. Harry Moore of Bohrer & Moore Packing Company explains it this way:

"We built an addition for a meat cooler and two freezers back in 1950. The back walls of the cooler and one freezer are about four feet below grade. The cooler was completed first. We had a lot of trouble with seepage through the uninsulated wall of the cooler. Later we installed FOAMGLAS on the inside walls of the freezer and we haven't been bothered again with seepage."

Mr. Moore also gives his cellular glass insulation credit for withstanding extremely heavy floor loads, reducing vermin trouble to an absolute minimum and enabling them to maintain economically a constant 38° F. in the cooler and 8° F. in the freezers.

Throughout the meat-packing industry more and more plants are switching to this unique insulation, the only one composed of sealed glass cells which are waterproof, fireproof, rot-proof and vermin-proof. This remarkable combination of properties makes FOAMGLAS the ideal insulation for *your* plant, too.

For more facts on how to install and finish FOAMGLAS, write today.

Pittsburgh Corning Corporation
Dept. T-25, One Gateway Center
Pittsburgh 22, Pennsylvania.
In Canada: 57 Bloor St., W., Toronto, Ontario

Owner Harry Moore indicates the grade line on the rear wall of his cooler. Bohrer & Moore was bothered with seepage of surface moisture into the adjacent freezer until it was insulated with FOAMGLAS. Engineer & Contractor was Russell Dresher, Wapakoneta, Ohio.

Refrigeration For Cheese

The role of French refrigerating equipment in the cheese industry was emphasized by Monsieur R. Thevenot and M. Anquez of the French Ministry of Agriculture. From the total of 2,000,000 cubic meters cooling space installed in France, 350,000 are used for storage of cheese, whereas in comparison, 100,000 is used for fruit storage. Capacity of Government owned cold stores is 650,000 cubic meters. In the cheese cold stores, three systems of cooling are used: direct expansion — 200,000 cubic meters, iced water 95,000 cubic meters, brine 55,000 cubic meters. The distribution of air in the refrigerated stores is performed in three different ways: natural air circulation — 75,000 cubic meters, forced air circulation with air ducts 55,000 cubic meters, forced air circulation without air ducts 220,000 cubic meters.

Control Of Relative Humidity

A system for automatic control of relative humidity in cold stores was presented by Prof. S. A. Andersen head of the Danish Refrigerating Research Institute of Copenhagen. It is well known that the air in cold stores tends to be too humid when the outside temperature decreases in the cold season. The author proposed a method of preventing the increase in relative humidity by supplementary reheating of the air at the outlet from the air cooler, the heating operation being controlled by a dual thermostat, shown in Fig. 16.

A small bottle connected by a capillary tube to the upper bellows assembly is fitted with a constantly wetted wick and acts as a wet bulb so that the pressure inside the bottle corresponds to the wet bulb temperature of the air. The bottle connected to the lower bellow acts as a dry bulb so that the pressure inside this bellow corresponds to the dry air temperature. By means of an adjustable spring, the pressure difference between the two bellows can be set at any desired value corresponding to the desired relative humidity. When the heating unit dries the air too much, the temperature of the wet bulb decreases and the pressure in the upper bellow decreases so that the pressure difference between the bellows increases causing the switch to break the electric circuit to the heating unit and vice versa. The thermostat is now manufactured by the Danfoss Company of Nordbork, Denmark.

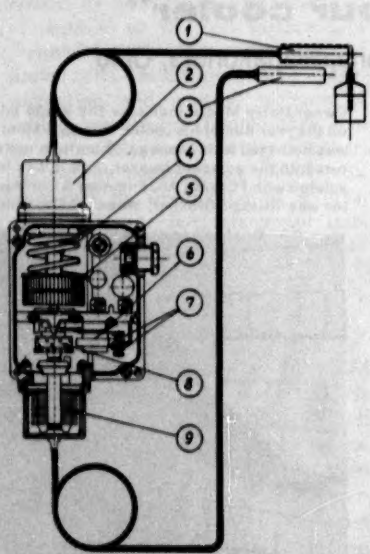


Fig. 16—Automatic Humidity Control.

High Humidity Systems

A comparison of two types of high humidity cold storage systems was made by C. P. Lentz and W. H. Cook of the National Research Council, Ottawa. The maintenance of high relative humidity in the storage rooms is of importance if surface dessication of frozen food is to be avoided. Weight loss can be as high as six percent after long storage. Although the damage can be prevented by packaging, this method has practical and economic limits. The authors discussed two methods for maintaining high relative humidity in cold storage rooms at minus 18 C.

The first system involved direct humidification of the room air, moisture condensed on the cooling coils being absorbed in a non-freezing solution of ethylene glycol sprayed over the coils and then returned to the room air from a continously operating spray solution concentrator. Fig. 17. In the second system, the dry refrigerating air flowed through a jacket surrounding the storage space in Fig. 18. Relative humidity depends on the temperature rise of the air in the jacket, hence on the flow rate. A temperature rise of ½ C gave a relative humidity of 96-98 percent. Space temperature variations were less than 1 C during most tests. In comparison of the power requirements it was stated that direct humidification from 60 to 100 percent relative humidity approximately doubled power consumption and increased the refrigeration load by a third. In the second, jacketed system, a 10-15 percent increase in power was required for air circulation.

Distribution Of Air

A novel system of distribution of air in the cold rooms was proposed by P. Clement and J. Remy of Paris. This system has some points in common with the previous, Canadian proposal discussed by Messrs. Lentz and Cook, as both aim at dehydration of air in a similar manner. As the cooling load is used to compensate for the heat in leaks, which are continous, and for cooling the commodities, which is discontinuous, the authors proposed to totally surround the coldroom with a space of circulating cold air, the access to the chambers being through openings in the vertical walls covered with aluminum flaps which are partially counterbalanced and functioned as non-return valves.

At stationary cooling load, the cold air is circulated round the walls,

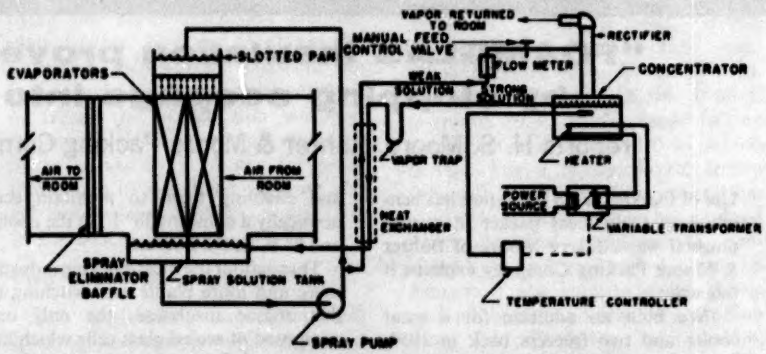


Fig. 17—Schematic sketch of equipment for maintaining high humidity in cold rooms.

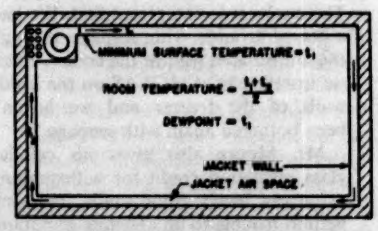


Fig. 18—Schematic sketch of jacketed room to maintain high humidity.

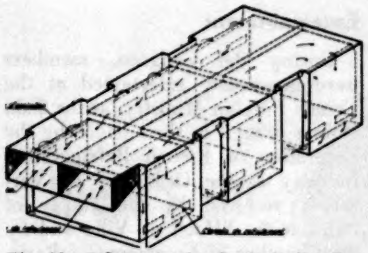


Fig. 19—Schematic sketch of air distribution in cold room.

ceilings and floors of the cold room by a fan. As the cooling load increases by introduction of some merchandise, a second fan is started. This increases the air pressure and cold air lifts the flaps and enters the storage rooms. When the second fan is stopped, circulating air pressure decreases, the valves close and air circulates round the walls only. The arrangement is shown in Fig. 19.

Technical Specifications

Minimum technical specifications for cold stores were discussed by G. Vassogne of Paris. To be classified as a "public" or "semi-public" refrigerated warehouse, the following requirements should be fulfilled. Blueprints of the whole installation should be submitted to the respective authorities, indicating its characteristics, including number of rooms, and for each room its working surface, volume and charge and lowest obtainable temperature. The maximum cooling load should be stated and the capacity of the refrigerating machinery. The rating and characteristics of the electric motors should be given. The compressors should be able to deal with the maximum load. The minimum number of compressors should be two, with at least one as stand-by. Special regulations should be observed in the machine room, concerning its dimensions, ventilation and general safety of the personnel. Special directives should also be observed regarding the evaporators with special reference to humidity of the cold air and defrosting problems. Regulations relating to pumps, dynamos, other electrical equipment, insulation and instruments should also be observed. Fire fighting equipment should be kept in state of efficiency.

Industrial Application Of Absorption Refrigeration

Industrial applications of absorption refrigeration plant acting as heat pumps to perform the dual duty of cooling at a low level and heating water up to 54 C were described by Dr. W. Niebergall of the Technical University of Berlin-Charlottenburg. The hot water for heating or domestic purposes is recovered from the condenser of the generator and from the absorber of the absorption machine. A diagram of such unit is given in Fig. 20.

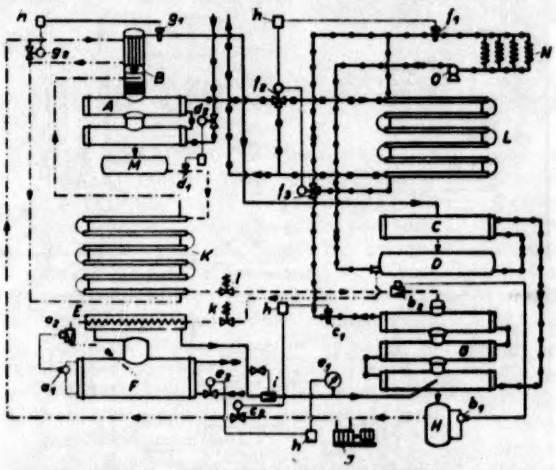


Fig. 20—Absorption refrigerating plant for heating and cooling.

A similar plant was, in fact installed in the Hotel Claridge in Paris. The cooling load of 50,000 Kcal/hr is used for air conditioning and the heat rejected in condenser and absorber is about 131,000 Kcal/hr, the hot water being used in the kitchen and in the hotel rooms. An ammonia absorption installation of heating load of 1,060,000 Kcal/hr, constructed by the Borsig Co. of Berlin was also described, the warm water having a temperature of 45 C. As the heat input to the generator is about 670,000 Kcal/hr, the heat ratio is 1.6 with saving in fuel of about 30 percent. The author believes that in spite of higher initial cost, the ammonia absorption installation has a definite economic advantage as compared with the normal hot water installations.

Heat Pumps On Ship

Economics of a heat pump on board a ship was discussed by Lord Gordon, Chairman of J. & E. Hall of Gr. Britain. The plant described referred to the 20,000 tons passenger ship "Southern Cross" operating on the London-Australia and New Zealand line. The plant consisted of ten eight-cylinder high speed "Freon-12" compressors running at 1000 rpm. The cooling load of 8,500,000 Btu/hr at 35 F was required for air conditioning and the heating requirements were estimated to be 9,000,000 Btu at 115 F, sea water in extreme conditions being heated from 40 to 105 F.

For the production of 9,000,000 Btu/hr heating, fuel consumptions would be: heat pump 412 lb/hr, 1,445 lb/hr if the heat had to be produced by electric water calorifier supplied by a diesel generator, i.e. the fuel consumed for electric heating would be 3.5 times that consumed by the heat pump. For a typical installation on board ship, the saving of fuel could be in the neighborhood of $40,000, the capital investment for the necessary modifications to make the installation suitable for the extra heating being about $15,000.

The general conclusion is that although a heat pump installation on board ship for heating alone would probably not justify itself, in view of the heavy capital investment, in cases when both cooling and heating are required, such a solution has a great economic advantage. A number of ships in the British Navy, said Lord Gordon, are already equipped with heat pump installations.

Stratochamber For Aeronautical Research

A new stratochamber for aeronautical research, commissioned for the French air force was described by Monsieur A. Neuenschwander of Etablissement Brissoneau & Lotz of Paris. The main chamber had a volume of about 2,200 cu. ft. Temperature and vacuum conditions, equivalent to altitudes up to 82,000 ft. over sea level were obtainable. The conditions of climb from sea level 15 C to 36,000 ft minus 56 C are said to be obtainable within five minutes. The refrigerating capacity required was provided for by a multicylinder compressor running at 950 rpm for the high pressure stage and a supersonic centrifugal compressor operating at 18,000 rpm for the low pressure stage, its capacity being 1.4

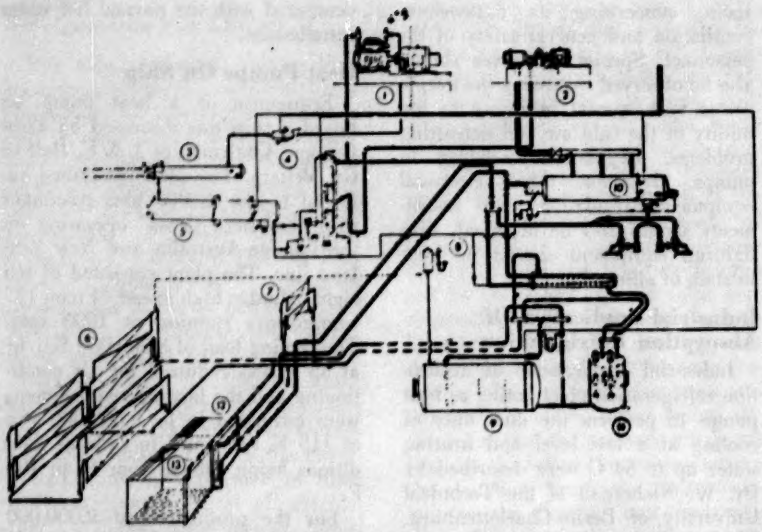


Fig. 21—Schematic diagram for strato chamber designed for aeronautical research.

m³/sec. This is an example of combination of a piston and a centrifugal compressor. The total compression ratio was 27:1. The refrigerant circuit consists of a "Freon-12" and a trichloroethylene cycle, some of the "Freon-12" precooling part of the trichloroethylene. The lowest temperature obtainable was minus 80 C. The refrigerant flowsheet is shown on Fig. 21.

Chilling Electrolytic Solution Of Zink Sulphate

An application of vacuum cooling to chilling of an electrolytic solution of zinc sulphate was described by Prof. J. Nagaoka and S. Takagi from Tokyo. In the process of refining zinc, cooling of the electrolyte is necessary in order to prevent contamination with lead. Cooling by conventional heat exchange is troublesome because of gypsum precipitation on the heat transfer surface.

In the example described, steam ejectors and a water jet condenser was used. Two stage evaporative cooling was employed. The electrolyte was cooled from about 60 to 35 C in the first stage evaporator kept under vacuum by the water jet condenser and then to 20 C in the second stage evaporator kept at high vacuum by the steam ejector, the steam being then condensed in the water jet condenser. A diagram of the plant is given in Fig. 22.

Places Of Interest

During and after the Congress, Members had the opportunity of visiting various places of interest, among them the Refrigerating Experimental Station at Bellevue, where research connected with equipment and biological problems of the French refrigerating industry is carried out under the direction of Prof. P. Laine, Head of the Station and Prof. R. Ulrich. Work there is divided in three main fields of research, problems of low temperature physics, including performance of refrigerating equipment, heat transfer problems and laboratory of applied biology.

Entertainment

During the Congress, members were generously entertained at the French Foreign Ministry, at the Gala Dinner offered in their honor by the Federation of French Refrigeration Industry at the Orangerie de Versailles, received by the Mayor of Paris at the l'Hotel de Ville and by the Chamber of Commerce of Paris. The Congress banquet was held at the Palace deChaillot.

The French Organizing Committee, and especially Monsieur Ch.David, Director of the International Institute of Refrigeration were cordially thanked for their generous and kind hospitality.

The place of the next Congress is to be decided and announced in the near future.

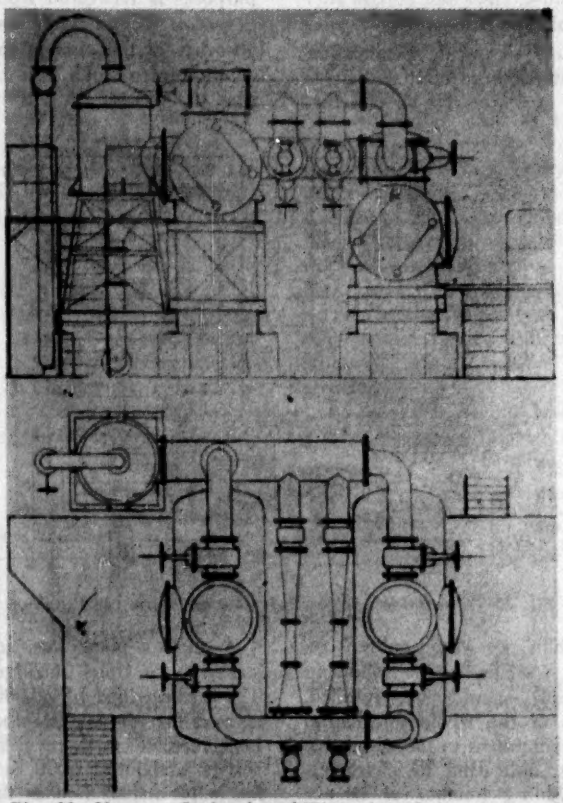


Fig. 22—Vacuum Cooler for chilling electrolytic solution of zinc sulphate.

Iced Crates Protect Fish

NEWS that a truck loaded with 10,000 pounds of fish had turned over and burned attracted a crowd from miles around Pineville, N.C. But the impromptu fish fry they expected did not take place. The fish, which had been packed in individual iced crates, was undamaged by the fire.

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Here are the major improvements

A NEW HEAT SOURCE - Instead of using only the sensible heat of the THERMOBANK, the new "L" THERMOBANK now utilizes both its sensible heat plus its latent heat of fusion by actually freezing a tube of ice around its reevaporator coil during the defrost. (The "L" stands for latent). This, coupled with significant improvements in the design of the reevaporator coil, gives the "L" THERMOBANK four to five times more heat storage for instant defrost and complete reevaporation.

NO LIQUID REFRIGERANT TO COMPRESSOR - With the vastly larger amount of heat now available in the "L" THERMOBANK, no liquid can return to the compressor during defrost. This is a singular and distinctive feature of the "L" system vastly different from any other automatic hot gas defrost system now available.

CONSTANT CRANKCASE PRESSURE - The "L" system maintains a predetermined low crankcase pressure, thus permitting the use of standard low temperature compressors without danger of motor overloading during the defrost, or oil foaming upon resumption of the refrigeration cycle. The low temperature compressors are less costly since they deliver more Btu's per horsepower.

NO EXTRA SUPERHEAT DUE TO REEVAPORATOR - On larger systems the suction line by-passes around the THERMOBANK during normal operation, thus eliminating any superheat pick-up from the bank by the suction gases during normal operation. This is very important with F-22.

"LOW-LOW" TEMPERATURES - Extremely low temperatures are now achieved with the "L" THERMOBANK and a complete line of "Low-Low" systems are now available.

NO WINTER PROBLEMS - The "L" THERMOBANK can be housed in an unheated space, thus making possible the use of the "L" THERMOBANK in any location, even the arctic circle.

KRAMER TRENTON CO. • Trenton 5, N.J.

Southeastern Chapter Meets in Nashville

MEMBERS of the Southeastern Chapter of the National Association of Refrigerated Warehouses held their Fall Meeting October 12-13 in Nashville, Tenn.

Chapter Chairman C. A. Bowen, Jr., president and treasurer of Noel & Company, Inc., Nashville, opened the meeting with a tour of his company's plant and of Polar Cold Storage, Inc., where the refrigerated warehousemen observed the modern operations of these plants. The business session was highlighted by speeches given by G. J. Stecker, president, Merchants Ice and Cold Storage Co., Inc., Louisville, Ky., who discussed the latest U. S. D. A. news, and William C. Hudlow, Jr., president of Chattanooga Warehouse & Cold Storage Co., Chattanooga, Tenn., who gave an informative talk on new construction. William J. Hoover, Assistant to Director, The Refrigeration Research Foundation, spoke on the newest packaging developments.

AWA Convention Will Provide Full Program

THE official announcement has been made by I. S. Culver, San Francisco, general president of the American Warehousemen's Ass'n that the annual convention will be held at the Statler Hotel, Los Angeles, April 9-13, 1956.

Again featuring its all-panel sessions, NARW assures a "grass roots" approach to all problems affecting the refrigerated warehouse industry, under the chairmanship of F. D. Newell, Jr., NARW president, of Minneapolis, Minn. All phases of warehouse operations will be covered in the convention business sessions with emphasis on industrial relations, mechanical handling, and insurance.

Registration of the convention itself will start on Saturday afternoon. The AWA Opening General Session will begin at 9:30 A.M., Tuesday, April 10. Program particulars will be announced later.

North Pacific Chapter

THE FALL meeting of the North Pacific Chapter, National Association of Refrigerated Warehouses, was held at the Multnomah Hotel, Portland, November 10. Future plans in the fields of industrial relations, legislation and over-all warehouse operations were discussed. Alex Olsson, Terminal Ice & Cold Storage, Chairman of the chapter, presided.

Southwestern Chapter

AT THE meeting of the Southwestern Chapter, National Association of Refrigerated Warehouses, October 14-15 at the Adolphus Hotel, Dallas, Texas, R. T. MacKenzie, vice-president, United States Cold Storage Corp., was elected chairman. Elected vice-chairman was V. C. Stevens, executive vice-president, Alford Refrigerated Warehouses, Dallas. S. C. Wentworth, Cold Storage Division manager, Scobey Fireproof Storage Co., San Antonio, was chosen Secretary-Treasurer.

The meeting was attended by more than 30 southwestern refrigerated warehousemen, as well as F. D. Newell Jr., president of NARW, G. J. Stecker, vice-president, Wm. Dalton, executive vice-president, and H. C. Diehl, director Refrigeration Research Foundation.

LETTERS

Picture Shows Apparent Lack of Safety Devices in Engine Room — Engineer Corrects

Van Nuys, Calif.

I have just finished reading the October issue of INDUSTRIAL REFRIGERATION. As usual, I found it most interesting. However, I found an article in this issue, with which I could not entirely agree.

The article to which I refer appears on page number sixty-eignt and concerns the Geyser Ice Plant of Waco, Texas. The general impression that I received was that this company had the cleanest engine room in the country, and the accompanying picture was considered proof of this fact. Well, it may very well be the cleanest, but it certainly is not the safest, and it might be well for Mr. Leonard to take another look at his plant.

In the picture there are three vertical and one horizontal compressors. None of the vertical compressors have guards over the wheels, and the belts and rails around the horizontal one are certainly inadequate. No matter how clean the floors may be, there is always danger of a man slipping and falling into the belts or wheels on those compressors.

It is my opinion that Mr. Leonard should install guards on those compressors before using his plant further as a model of safety.

I feel that my opinion should be of some value, since I am presently employed as a maintenance engineer for Anheuser-Busch, Inc. In Van Nuys, Calif.

CURRY A. ROBERTS
Anheuser-Busch Inc.
Van Nuys, Calif.

Reply From Leonard

Dallas, Texas

I wish to thank you for your letter of November 7, and for the copy of the letter regarding our Waco plant. Actually, we ran this article to see how many inquiries or replies we would get about the guards around the machinery and equipment. We had just taken over this ice plant, the Geyser plant at Waco, about the time of this meeting, and our chief engineer, Mr. Thompson, down there was in the process of cleaning everything and fixing to put up new guards to replace some old ones that had been there for years. I hesitated to take the picture the day we did and run this safety article; however, the plant looked so clean I wanted to give someone credit for it. When I got the material up for you, and sent it to you, it entered my mind that I was curious to see how many fellows in this country would look at it and write a letter in.

This letter is the second time we have had it called to our attention. There was one man with some dairy out in San Francisco that called it to our attention, and they can rest assured the guards are up, and the belts and flywheels are well guarded. Mr. Thompson, our chief engineer, had these out of the plant at that time to replace them. The other company, from whom we purchased this plant, had a lot of old equipment in there and we were in the process of cleaning it out, and we were also happy as to getting it this far along, and this clean, was why I did the article when I did, knowing full well all the time that our hand would be called on it because the guards were not up. The next week they were up, with new piping and fences put around these compressors. In the near future I will try to get another picture and just send to you for your file, showing this plant after it was well guarded, but we did have the curiosity of seeing how many wide-awake safety men there were sitting around over the country who might notice this and write in about it.

W. F. LEONARD, JR.
Insurance Department
The Southland Corporation

Truckers Show Interest in Frozen Foods

PACKERS of frozen foods have some concrete evidence at last that the trucking industry is regarding them as something more than modern Cinderellas. This development came to light after the annual American Trucking Association convention in Washington when ATA announced that a special division has been formed for refrigerated carriers. Representatives of the National Association of Frozen Food Packers at the convention had urged such a move by the truckers' association.

ATA disclosed that the new division has been named the Refrigerated Carrier Division with Sidney Alterman, president of Alterman Transport Lines, Inc., Miami, as temporary chairman. In the complex ATA structure, the new division is located within the Common Carrier Conference — Irregular Route. Managing director of the Common Carrier Conference is Thomas R. Robertson.

Lawrence S. Martin, secretary-manager of NAFFP, called this move "a long step toward solution of the many problems which have confronted frozen food packers, particularly small packers, who are largely dependent upon motor transportation to get their products to the markets."

"It constitutes recognition of the frozen food industry," Mr. Martin said, "as an increasingly important segment of the over-all food industry. Truckers who have been turning down less-than-truckload shipments of frozen foods as being unprofitable are now convinced that they have been doing so at the risk of losing more important business in the future."

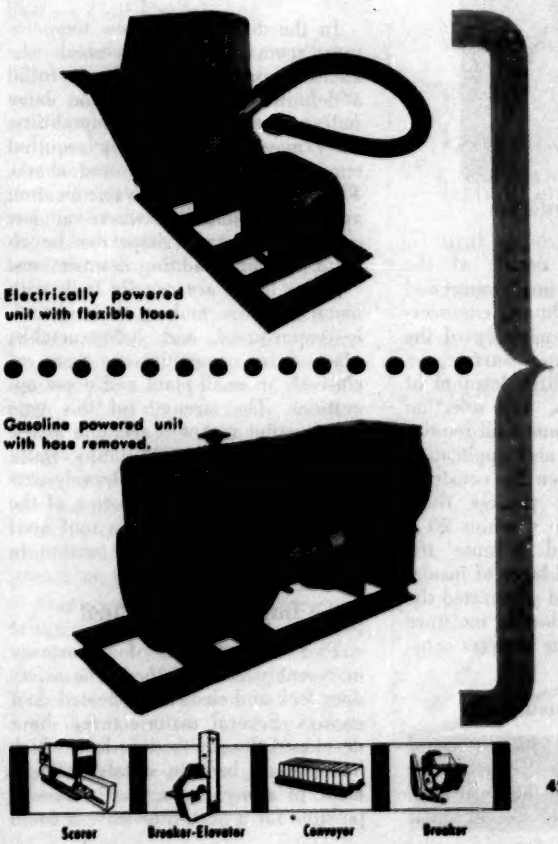
Provides Central Agency

Main purposes of the new division are to provide a central agency through which refrigerated truckers can exchange information and experience, develop improved mechanical equipment, devise better handling methods, and maintain liaison with frozen food shippers in the solution of mutual problems.

Both Martin and Robertson credited efforts of the NAFFP Transportation Committee and the Transportation Equipment Committee with bringing this development to a head. Martin recalled that the first step was taken last March when the packer committee invited trucker representatives to a joint conference during the National Frozen Food Convention in Chicago.

"As a result of this meeting," he said, "the truckers formed an independent Refrigerated Motor Carrier Committee outside the ATA organization. And even though the work of this committee was strictly unofficial, it attracted the attention of ATA officials and led to an invitation to NAFFP to participate in a panel discussion of frozen food shipping problems during the ATA convention."

At the panel meeting on October 18 the possibility of giving refrigerated carriers divisional status in ATA was proposed by T. C. Borden, chairman of the packers' Transportation Committee and traffic manager of Exchange Lemon Products Co., Corona, Calif. Although this idea was concurred in by Alterman and Cyrus B. Weller, president, Frozen Food Express, of Dallas, the two trucker representatives on the panel, ATA officials doubted that association officials would agree.



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Practical Refrigerating Engineer

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

The Modern Hardening Room

FRANK CORDOZA
Refrigeration Engineer
Foremost Dairies, Inc.

HARDENING room requirements of an ice cream plant are more involved and complex than is generally conceded. While there are no hard and fast rules for all such rooms, good common sense and engineering are the basic requirements to insure the proper design to fit the operation to be served.

Too often a hardening room is considered merely a necessary evil — a place to put the product to freeze. Actually this is only one of the operations performed there. A good hardening room must accomplish the following functions:

1—Freeze the product quickly and efficiently;

2—Provide adequate space to store the product to accommodate a level production rate;

3—Have proper facilities for loading in, storing, and loading out with a minimum of handling; and

4—Provide means for fast, simple inventory.

Inasmuch as this last item is largely a problem of warehousing, unless considerable thought is given to space and conveyor design, inventory can become difficult and expensive.

Design Considerations

Size of the room depends largely on the number of items manufactured and the size of the operation. Some large production plants may inventory as many as 350 items, thus requiring more space than the plant of equal capacity that may inventory 40 or 50 items. However, with proper freezing facilities and inventory control, 20 to 35 square feet — with a 10 ft ceiling — will be sufficient space for each 100 gallons of product per 24-hour production period. Proper warehousing of the product is an important item because, unless air can circulate freely around the products to be frozen, the time required for the products to remain in the room is greatly increased and in a direct ratio reduces the productivity of the room.

Frank Cordoza

The construction details of the room are of utmost importance and require careful thought and engineering. Here again the selection of the insulation, type of vapor barrier, design of floor and ceiling, location of doors and conveyors, and selection of refrigerating equipment all require practical knowledge and application of common sense. Even the construction mechanic must possess these qualities. A ceiling in a minus 20 F room once collapsed because the skewers in the second layer of insulation were too long and penetrated the vapor barrier, thus allowing moisture to infiltrate around the skewers causing them to dry-rot.

Vapor Barrier & Insulation

Importance of an efficient vapor barrier cannot be over stressed as the efficiency and life of the insulation depend on its dryness. Good insulation construction is very important. Experienced engineers are reluctant to take an old room out of service temporarily as unseen and unpredictable damage may occur. While most insulating material itself will not deteriorate with age, unless the application methods were good, it is possible to lose portions or all of the existing insulation while the room is out of service.

Most manufacturers of insulating materials have prepared specifications for the installation of their materials. If the application is right the life of the room is almost indefinite. The difference in cost of poorly and properly applied material will not be more than one or two cents a board foot. An owner cannot afford to risk the poor results for the small saving that can be accomplished by improper application of the material.

Portables For Utility

In the discussion of low temperature rooms, do not overlook the knock-down type. These boxes fulfill a definite requirement in the dairy industry due to their adaptability. They may be had for any required temperature range, size and shape. They can be moved from one location and re-assembled elsewhere at low cost. The size and shape can be altered by merely adding new sections.

These boxes are usually built with metal exteriors, making them virtually vapor-proof and indestructable. Many dairy companies use them exclusively in small plant and depot operations. The strength of this type construction makes it possible to use the outside walls as building walls, thereby effecting a considerably saving in the cost of construction of the depot or plant since only a roof need be constructed over that portion to complete the building.

Door Improvements Cited

Two developments of importance in recent years have been the safety door lock and electrically heated door gaskets. Several manufacturers have developed the safety door lock which has already become statute requirement in many states, that makes it possible for a person to leave a room

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Given before California Chapter No. 1, San Francisco, February, 1955; a condensed lecture for beginning engineers. Author is a past president of that Chapter and a member of ASRE.

EXECUTIVE OFFICE NAPRE
433 N. Waller Ave.,
Chicago 44, Ill.
OFFICERS
President: Regis Gubser
Los Angeles, Calif.
Secretary, J. R. Kelahan, Chicago 44.

Operating engineers of all refrigerating plants are invited to affiliate with the National Association of Practical Refrigerating Engineers, Inc., an educational association, "not-for-profit".

even though it is padlocked from the outside. This type lock will eventually become standard equipment. Undoubtedly, it will effect a saving of lives, besides giving a lot of peace of mind to those who work in low temperature rooms.

Electrically heated door gaskets have been widely used in recent years by many ice cream manufacturing firms, and their performance, when properly installed, has been excellent. One firm in San Francisco, alone, has about 20 sets now in operation and in each door case the re-gasketing expense has been reduced to practically zero. Other than for damage that is done by hand-trucks, etc., the life of a gasket would be indefinite — probably equal to the life of the door on which it is applied.

Cost of the application, complete with gaskets, will usually be about $150.00 with an operating cost of $18.00 to $25.00 per year afterward. Experience has been that the heating of gaskets pays for itself, usually within the first year, in savings effected by not having to re-gasket; plus the saving effected by the reduction of refrigeration loss — to say nothing about the time and effort expended and the exasperation of thawing frozen doors.

Shows Hot Gas Defrost Ceiling Coil Preference

The selection of the proper refrigeration equipment is probably the most important single item of the entire project. The load must be carefully calculated and provided for. The importance of careful design is best illustrated in the fact that it requires more refrigeration to condense and freeze one pound of moisture than it does to harden three gallons of ice cream.

Use of ceiling type, hot-gas defrost units has won wide recognition in recent years. They are ideal for this purpose as they are highly efficient, defrost automatically, maintenance costs are low, and hot gas is always available at no extra cost. When used with a liquid separator, low superheat may be safely used, thus increasing the capacity of the unit over its rating and closely approaching that of a flooded unit.

Another advantage of this type unit is that it requires no expensive floor space or duct work. The Golden State Co., Ltd., Div of Foremost in the San Francisco Bay Area now has 58 large units in operation in three plants with a combined capacity of over 65,000 gallons of ice cream daily. These units have proven satisfactory in these installations.

Mechanized Product Handling

Basically, hardening rooms have not changed a great deal since ice cream became known as a wholesome food, rather than a luxury item. They perform exactly the same function now as then; differing mainly in the flow of product and the size. Twenty years ago rooms rarely exceeded 400 sq ft. Now rooms of 5,000 to 7,000 sq. ft. are commonplace. With the larger room, the manual handling of product has been reduced to a minimum with one box-man handling from 500 to 1500 gallons of product per hour. Several systems of handling the product in the rooms are being used, including roll-away shelves, palletizing, and conveyor systems.

A well designed conveyor system undoubtedly makes the best utilization of space and labor. The possible exception is in rooms with high ceilings in which the palletized operation utilizes the otherwise unavailable high space. A high ceiling is desirable in a large cold storage or freezer storage room because there is no problem of rotation of product as lots often

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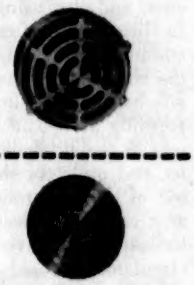

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stay in for several months before they are moved; also, a high storage area provides the maximum cubical storage space for the minimum cost of construction. However, high ceilings do not lend themselves well to ice cream hardening room operations as the space above which a man can conveniently work is expensive to build and merchandise.

Floor Heaving Problems

Floor heaving has often caused damage to cold rooms and sometimes the building structure itself. When this happens, the remedy is difficult, and sometimes the expense is prohibitive. Engineers have used the knowledge gained from past experience and, by using proper fill with facilities for drainage, heaving is becoming a lessening hazard. One of the cheapest and most effective methods has been laying 1½ inch pipes, forming a coil, at about 4 ft on centers in the subfloor concrete. The inlet and outlet of this coil is stubbed out of the cold room and capped off at a convenient location. At the first indication of heaving, warm liquid is circulated through the coils. This keeps the subfloor warm and heaving cannot occur. The liquid to be circulated can be high pressure refrigerant from the system, which will recover the loss of refrigerant; or, if this is not practical, warm oil or even brine could be used as a heating medium.

One firm recently perfected and patented a method of installing conduits and electrical heat in floors that already have begun to move upward. While the author has had no personal experience with this method, it appears to be a sensible and practical solution to a difficult problem. The engineer shudders at the thought of drilling horizontal holes under a room to insert heating pipes, especially since the results cannot always be predicted. With the vertically drilled electrical system, heat in the required amount and place can be applied. (This method was fully described in the October 1954, INDUSTRIAL REFRIGERATION.) Advance precautions against floor heaving, or its correction when occurring is only one more of the problems that must be considered and planned for if a hardening room is to accomplish its purpose economically for many years.

News Notes and Chapter Activities

Stockton-Modesto

HARRY DYER

THE KING course on refrigeration is being continued in our classes and we are now discussing compressor calculations. This is an important factor in the operation of refrigeration plants, and one which should be fully understood by those closely connected with the plant's function. Much blackboard work is involved and the chapter on compressor calculations will take some time to cover. The educational committee is to be congratulated on the extensive work they are putting in on this phase of the course.

A member of the chapter is making a trip to San Francisco to purchase the 16 MM projector donated by companies of employes who are members of the chapter and by the members themselves. It is believed that with the aid of a 16 MM sound projector, the educational program will show a decided increase in membership attendance and participation. We wish to thank all those contributing and certainly appreciate the donations toward the betterment of our educational program and chapter activities.

Memphis

CHAS. CONLEY

ON WEDNESDAY, October 19, H. L. Todd, the chapter's instructor was absent because of illness. John H. Robinson, chairman of the membership committee took over. With the aid of a cutaway compressor with all of its parts, and a small compressor with evaporator coils and condenser with all controls in operation, he explained how the compressor worked, showed how the controls worked, what effect pressure had on the temperature of the refrigerant, and how the air temperature affected condensing pressure. The cutaway compressor was dismantled and put back together. All contributed much to the membership's understanding of the refrigeration system and compressor functions.

Chicago

BILL O'REILLY

FUNDAMENTALS of Refrigeration was the topic of discussion of the preliminary refrigeration class September 13. Chicago Chapter's own Gene Rytlewski, York Corp., served as instructor, with all members participating. A business session followed, concluding with a get-acquainted party.

At the October 11 meeting, President Nick Downes read two questions which were submitted to the Question box. The answers to these questions were not found among the members present. A suggestion was made, that Mr. Downes select a group to seek out the answers to these questions. If this group cannot come up with the answers, the questions will be referred to the NAPRE Question Box.

During the business session nine guests were introduced, one of them from Los Angeles. There were six applications for membership, all of whom were accepted.

John Heinzelman, Hubbell Corp., introduced by John Forti, program chairman, gave a very good talk on capacity control valves, on October 11, explaining the function, construction and application of solenoid valves, such as back pressure, compensating back pressure and due pressure regulating valves. Cutaway valve displays and drawings were shown. Mr. Heinzelman pointed out there is a solenoid valve designed for each individual job; the performance intended should be taken into consideration when purchase of valves is made.

Refrigerated Enclosures was the discussion subject of the refrigeration class on October 25. Don Rosenbloom, served as instructor. He explained the four requirements needed for any refrigerated enclosure and the eleven requirements needed for a good insulator. He said the best insulator would be a vacuum for a large space but the cost and technical difficulties would be far too great. The many types of insulation used and their consistencies were also discussed, followed by an explanation on moisture proofing.

Messrs. Lars Brown and Robert Shannon of Gates Belting Corp. presented a few slides showing the four types of drives used up to ten years ago which were direct drive, chains, gears and flat belts. Mr. Brown explained the advantages and disadvantages of these types of drives.

There were two new applications for membership and both were passed unanimously. New applicants were then introduced. President Nick Downes introduced O. R. Elofson of Washington, D. C., advertising director for INDUSTRIAL REFRIGERATION.

Clifford A. Rife

Cliff Rife, who had been a member of Chicago Chapter, NAPRE, since 1950 passed away on September 24. Cliff has been active with consulting engineers, working primarily on ventilating and air conditioning design. At the time of his death he was employed by the Skidmore, Owings and Merrill Company. He was active in the American Society of Heating and Ventilating Engineers, as well as the Chicago Park District Grant Park recreational program.

St. Louis

BILL ALLEN

A DOUBLE-BARRELED contest type of program with Al Loeffel, as Master of Ceremonies, promises a keenly interesting year, full of practical value for all. There is to be a pay-off at each regular meeting to at least one man who is either lucky or smart—maybe both, and every man present will win points for the grand pay-off at the end of the season.

"Test your head pressure" will offer a chance to score points in a refrigeration question and answer period. The pay-off problem may be any practical refrigeration question submitted by a member. The member will receive points for any question accepted. If the problem stumps the panel of "experts," then the member will earn a triple score.

St. Louis Chapter attends to its serious business most of the year, but occasionally gets together for a social affair where

members can become better acquainted. The annual barbecue at the Baden Legion picnic ground Saturday afternoon, October 8, was such an event.

Some unusual features of refrigeration equipment caught the interest of NAPRE members visiting Griesedieck Brothers Brewery for the first meeting of St. Louis Chapter's fall program September 19. Roland Hillebrand and Ed Lotte represented the brewery as hosts. After an inspection of power plant and refrigeration facilities, they conducted the visitors through the fermenting cellars where refrigeration plays a vital role in air-conditioning and process control. Assembled later in the Capitol Room of the brewery, the members enjoyed a variety of refreshments, and pronounced the brewery's product as excellent as its hospitality.

Washington No. 1

JOHN GRAINGER

THE Regular meeting and nomination of officers for the coming year was held on October 20 in the Orkilla Room of the Downtown YMCA. A buffet dinner, very much enjoyed by all present, was served. Mort Bell substituted for the chapter instructor, Bob Harrison, discussing the chapter on Evaporators. A telephone committee was appointed consisting of Bill Peck, Bill Allen and Joe Pierce, who volunteered for the work of calling all members prior to meetings. Bill Stone, general manager of W. E. Stone & Co., Seattle, followed with a talk on various types of condensers, their uses and applications, their good and bad points, together with maintenance and upkeep of same.

Los Angeles

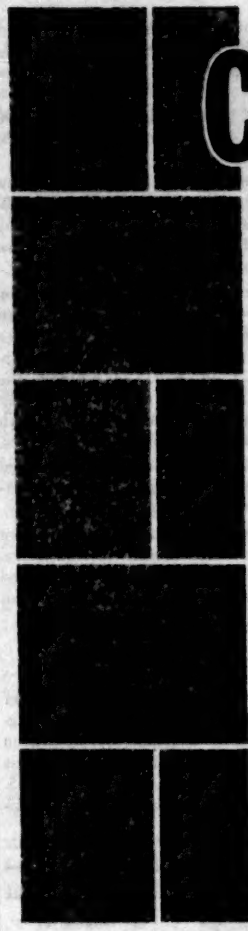
FRED HERR

THE staggering changes taking place in American industry with the development of automation was discussed at the October 19 meeting of Los Angeles Chapter, NAPRE, by W. E. Cline, manager of the General Electric Service Shop, Los Angeles.

Speaking on the subject "Productive Maintenance," Mr. Cline declared that advanced engineering and planning being done and carried out will more than double the industrial power requirements of this country within the next ten years. By doubling generating capacity, he pointed out, a real chain reaction is created in that, at every step, this power has to be regulated, controlled, measured and protected.

"As automation becomes a reality," Mr. Cline said, "industrial management must take a closer look at the true cost elements in producing goods. The direct labor content of the finished products will become less and less as plants become more and more automatic. At the same time, invested capital for machinery, facilities and equipment will increase tremendously, and the depreciation must be included as part of unit cost in producing goods."

The speaker said that another important element of cost which will increase tremendously under automation is main-



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tenance. Intricate machinery and drives will require a carefully planned, well engineered approach to insure continuous operation. An element of utmost importance, he said, is that loss which results from equipment failures.

Mr. Cline exhibited a typical curve used by General Electric along with maintenance records in connection with productive maintenance. It was noticeable in the graph that the failure rate is high at first and then fell to a minimum. After that, many years of uninterrupted service could be looked for, Mr. Cline declared, as the failure rate then increases gradually. This is the period, he said, during which major overhauls should be examined closely. After overhauling, Mr. Cline stated, the failure rate drops to a minimum again for many years of continuous operation.

"High failure rate," Mr. Cline said, "can be attributed to four factors: Design, application, human errors, and manufacturing errors. When overhauling equipment, however, only two factors enter into the picture, namely human errors and installation."

The October 19 business session was presided over by President Elmer A. Johnson, who served at the induction of one new member, Harry T. Craner, assistant chief engineer of the Huntington-Sheraton Hotel in Pasadena, Calif.

Membership chairman Frank Muzzy reported that, as of the meeting night, Los Angeles Chapter had signed up 64 new members, which he estimated, ". . . should be sufficient to bring the national pennant back to Los Angeles, unless some wily eastern chapter has been playing possum and comes through with a raft of new applications at the last moment."

A telegram from a member of New Orleans Chapter, asking if Los Angeles could use some good advice about putting on a national convention, was hooted down with proper disdain.

In a review of his administration, National President Regis Gubser revealed that NAPRE is continuing progressive growth. He reported on three new chapters: Denver, Colo., where 60 attended the organizational meeting and 23 signed up as charter members; Tampa, Fla., with 18 charter members; and Sioux City, Iowa.

The preliminary class was conducted by Guy King on the subject of air conditioning. Twenty-five were present.

No Los Angeles Chapter meetings were scheduled for the month of November. The last meeting of the year is scheduled for December 7 when the annual election of officers was to be held.

Jesse L. Shively

THE death of Jesse L. Shively, chief engineer and manager of the Refrigeration Division of the Cyclops Iron Works, San Francisco, Calif., died at his home in San Francisco August 19, 1955. Mr. Shively started working for Cyclops in 1901 and continued until his death, a period of 54 years. His first experience in refrigeration machinery was obtained in the Middle West. He came to Cyclops Iron Works to install the Merchants Ice and Cold Storage Company's plant at San Francisco which is still in operation. Gradually as work in the refrigeration department developed he became the chief engineer and manager of the Refrigeration

Jesse L. Shively

Division, which position he held until his passing. In the San Francisco Chapters of the ASRE and NAPRE he was recognized as "The Daddy of Refrigeration" on the Pacific Coast. He was a member of NAPRE for 30 years, was highly regarded in business and engineering circles, and his friends were legion.

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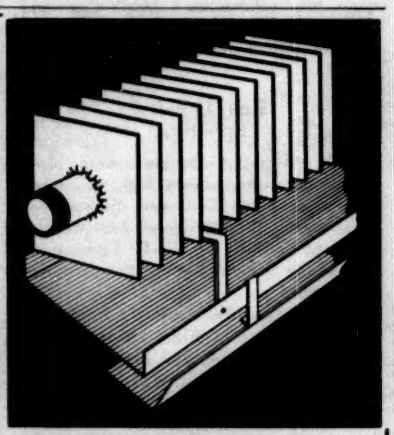

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From the President's Desk

NAPRE Looks Forward to Another Successful Year In 1956

AFTER having had the opportunity to listen to an excellent educational program at the 46th Annual Convention held in Los Angeles on November 8-9-10, we as members are fortunate to have such a fine array of talent in our ranks. Many phases of the refrigerating industry were discussed.

Committees for the ensuing year are all men with experience and rate high in the industry. I hope our membership will increase during the coming year as it has in the past. I urge our Members-at-Large who are located in cities to establish a Chapter and receive the added benefit of an educational program covering the refrigeration industry as applied to their particular locality. Kansas City, Sioux City, Denver and Tampa have recently been given charters.

How many of us stop to realize how refrigeration fits into our way of life? Whether we are working in factories. traveling through summer heat, enjoying choice foods, precision processing, reading the news in the comfort of an air conditioned home or club or, just bending an elbow, some place behind the scenes some branch of the refrigerating industry is responsible for the end result.

Opportunities for Beginners

There never have been so many opportunities for beginning persons in the field of refrigeration and air conditioning as there are today. In order to take advantage of the opportunity, one must be qualified and this is where the NAPRE can help the young engineer to improve himself. It's the beginner of today that will be the executive of tomorrow—providing, he improves himself for each succeeding step.

We who are active members in the Association are repaid many times for our effort in helping the beginners through our educational program. Lets make 1956 a banner year and see several more Chapters come into existence.

Immediate Objectives

To plan your work and then work your plan, is the advice your national officers have to offer chapter leaders for 1956. The national leaders, elected at the meeting in Los Angeles will try their best to show the way. Following are some of our immediate objectives on which we ask your assistance and cooperation.

In our 1956 plan, all members will be invoiced for their dues during December 1955. Some have received theirs late in November. It is believed that our previous method of dues collections from January to April came about at a bad time. Henceforth, dues will be collected in the fall of the year when we shall not be competing with invoices from Santa Claus and Uncle Sam (Income Tax Time). Chapter Secretaries and/or treasurers are asked to cooperate in mailing the invoices and promptly (weekly if possible) remitting to the National office.

Also to be circulated in late December are more chapters of the refrigeration course instruction manual. Professor Guy R. King has had Chapters 3 through 9 prepared for some time, but funds for publication and circulation had to be allotted by the Board. The Educational Committee should have those seven chapters ready for use locally at the January meetings.

Earlier Data Book Date

The Association's Annual Yearbook will make its appearance in February 1956. Chapters and all committeemen are encouraged to be prompt in closing advertising and editorial copy on Janury 10. Closing and publication dates were advanced in order to devote the balance of the year to a drive for new Industrial Members. That drive itself will close next October, allotting less than a year for such activity.

Once again, NAPRE is to have a "house organ". Temporarily discontinued by the Board a year ago, the Directors have revised their thinking and allotted a modest amount for a monthly news letter. This communication will carry messages and instructions from the National Officers and Committeemen. Circulation will be directly to all national officers, directors, past presidents, chairmen and chapter presidents. National committeemen will receive theirs from their chairman with their monthly instructions. Chapter officers and chapter committee chairmen will get theirs from the local secretary.

Membership Campaigns

Singled out for the first membership drive of the year is the dairy and ice cream industry. As in the past, chapters are to be furnished leads by the National Committee. One direct mailing will be made at the national level. It shall be the local responsibility for follow-up. Chapters which have given wholehearted and energetic support to their program in the past year, went home with trophies at the convention just concluded. It paid off for them in new members and nationwide recognition.

Most important to the method of calculating points in these annual contests is membership renewal. A cancelled or suspended member costs a chapter dearly, as the lost member is used as a multiplier in the formula. It works against the total points. Conserve those members to get a bigger and better chance at those prizes.

L. Etzel

Changes in Commercial Beef Grades Proposed

THE U. S. Department of Agriculture proposes that the Commercial grade of beef be divided into two new grades designated as Standard and Commercial. The present grades for beef are Prime, Choice, Good, Commercial, Utility and Cutter and Canner.

It is proposed that the division of the present Commercial grade be made on the basis of maturity and that the grade name "Standard" be applied to beef from carcasses of younger animals of the grade and that "Commercial" be retained for beef from mature animals falling in the present Commercial grade. The change is proposed in response to a recommendation from the Cattle and Beef Industry Committee.

The present Commercial grade includes carcasses from animals within the full range of maturity as animals are marketed. It differs in this respect from the Prime, Choice and Good grades which are restricted to carcasses from relatively young cattle. It was the opinion of the Committee that it is impractical to merchandise, under the same grade designation, beef from young animals which may qualify for the Commercial grade with only a small quantity of fat together with beef from much older animals which is required to have a much greater degree of fatness.

NAPRE

Question Box

The National Educational Committee, NAPRE, answers monthly in this column, operating problems forwarded by members. The Committee appreciates answers from the field. Address questions and answers to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif.

Thermometer Card Dissolves

QUESTION NO. 1079: Recently I decided to clean up a thermometer on a calcium brine pump discharge line. The thermometer was new about a year ago. Around the bottom inside the glass cover there had accumulated a pile of what I thought was slush ice or snow, which covered the lower figures on the thermometer. So I removed the glass and to my surprise I found the "ice" to be dissolved brass or whatever the figure plate was made of.

The mercury bulb is O.K. but that plate carrying the figures sure was dissolved or eaten up, or whatever you may call it. The white deposit was moist and like a thick paste. Instead of covering up the figure plate it was eating it. Now I've been around refrigeration plants quite a while but I never saw anything like this. There appears to be no calcium leaks around the instrument as the thermometer is in a well set into the pipe.—R.G.S., Buffalo, N. Y.

ANSWER: This is a difficult question and one for which I have no ready answer. Offhand, I would say that galvanic action of some sort had taken place. The white deposit which you describe as similar to a paste sounds very much like zinc hydrate, which is formed by the galvanic action of brine on zinc. Normally such compounds are converted to zinc carbonate on exposure to the carbon dioxide in air. However, if reasonably shielded from air, as would be the case with your thermometer, a slimy paste will continue to remain. Without a closer examination of the particular thermometer, I would hesitate to guess what might have caused the galvanic action in the first place.—H. P. Hayes.

Carbon-Dioxide Immobilizes Hogs For Slaughter

QUESTION NO. 1080: Reports reaching here some time ago indicated that in the U.S.A. some abattoirs are using CO_2 to anesthetize pigs before slaughter, by using dry ice. If you or any members could give me some details of the method employed it may possibly be most useful and helpful.—E.E., Sydney, Australia.

ANSWER: A process for anesthetizing animals for the slaughtering operation has been developed and patented by the George A. Hormel Company of Austin, Minnesota.

Hogs, prodded by an electric shocker, are moved toward a conveyor through runways. As the hogs near the conveyor, they are guided into the belt by rubber impellers. The belt leads to a tunnel containing 60 percent 00_2. The hogs are in the exposure chamber for 45 to 50 seconds. Actually, they are immobilized in about 15 seconds. As a hog leaves the chamber, it is shackled around the hind leg, automatically lifted on a chain drive and carried to the sticker. Because the hog is still immobile (it will remain so for about 20 seconds after leaving the chamber), the sticker is able to strike true on the first attempt.

It is claimed that there are no significant effects on the quality of meat as compared to that obtained by the more conventional methods of slaughtering.—H. P. Hayes.

(Note: Literature supplied for this answer, courtesy of Liquid Carbonic Corp.)

Fresh Water From Salt Water By Refrigeration Processes

QUESTION NO. 1081: I have read a number of articles recently on the subject of making fresh water out of salt water. One article mentioned the possibility of doing this by means of refrigeration. How would such a system work? Would it use the heat pump principle or actually involve the freezing of the water?—J.S., San Luis Obispo, Calif.

ANSWER: The principle of producing fresh water from salt water by a freezing-melting process has been known for a long time. The best illustration of this is seen in ships which travel in arctic waters. In the summer months potable fresh water has been obtained for shipboard use from ponds formed on ice floes by the melting ice.

The maximum density of pure water is reached at a temperature of 39.2F. However, as sea salts are added to fresh water, the temperature at which maximum density occurs is lowered. Actually, for typical sea waters the temperatures of maximum density are below the freezing points. Thus as sea water is frozen, fresh water precipitates as crystals of ice and the dense solution sinks to the bottom of the container. Essentially, in a frozen block of sea water, the top ice would be formed mainly of fairly pure water and the brine concentration would increase with the depth of the block. In principle, then, the freezing separates sea water into potable ice and briny ice. During melting, this separation can be maintained so that fresh water is produced by the overall freezing-melting operation.

Development of this process is still in the experimental stage and no conclusive study of the commercial economy of such an operation has been made. *Refrigerating Engineering*, July 1954, carried an interesting article on this subject.—H. P. Hayes.

Electronic Refrigeration

QUESTION NO. 1082: A new development publicized by an electronics firm is a thermoelectric refrigerator. Can refrigeration be produced by electronic means without using the usual vapor compression or absorption systems?—R.A.W., San Luis Obispo.

ANSWER: Some interesting work along these lines has been done by RCA and also by a number of British scientists. The principle of the thermocouple, in reverse, is the basic heart of the device.

When two wires of dissimilar metals are joined together to form a closed circuit and when one of the junctions is raised in temperature above the other junction, an electric current flows. The amount of the current depends upon the type of wires used and the difference in temperature between the two junctions.

In normal practice the current (or voltage) is measured and the measurement can be converted to temperature by means of special tables. If the action is reversed so that a current (as from a battery) is forced through the circuit, a hot junction and a cold junction are produced. These correspond respectively to the condenser and evaporator in a conventional refrigeration system. In practice, a large number of thermocouple junctions are arranged to form the evaporator and condenser, and the supply of electric current comes from a regular power source.

A working model of such a unit has been built and has actually produced a net refrigeration effect. Obviously, the power input per ton is very high on this preliminary model but at least the principle itself has been proved. Actually, the big research problem is to find some combination of metals which will yield a high enough ratio of millivolts to temperature, to make such a device commercially feasible.—H. P. Hayes.

Pre-Cast Roof Slabs

QUESTION No. 1083. What experience have NAPRE members had with pre-cast concrete roof slabs or decking? In our cold storage plants, especially freezers, we are having troubles with some of them. Hot air rushes up against the slabs, it condenses, and then freezes. When the door is open again it melts, and when doors are closed again it freezes. This is causing the slabs to go all to pieces. Any suggestions or remedies? P.P., Chicago.

ANSWER: The problem of obtaining long life from concrete exposed to alternate freezing and thawing has been studied extensively by the Portland Cement Co. A standard test has been developed which can produce in less than a month, the effects that normal exposure might take as long as 20 years to produce. These tests and observations have shown that requirements of concrete exposed to freezing and thawing are:

1. Structurally sound aggregates of low porosity;
2. Watertight cement paste thoroughly embedding concrete;
3. Proper consistency, so concrete can be placed without segregation;
4. Adequate curing; and
5. Suitable drainage.

In addition to the above it has been demonstrated that the lower the water-cement ratio, the more resistant concrete is to freezing and thawing. Details of the manner in which each of these requirements can best be met are available from the Portland Cement Association. There are also a number of powdered admixtures which, when added to the original mix, tend to produce improved resistance to moisture. Although these admixtures do not actually fill pores, they do help in the placing of the concrete to produce a more waterproof slab.

In cases such as yours where you must live with a floor or ceiling already poured, there are only two practical solutions.

1. Take all possible precautions to reduce the leakage of moist air to a minimum;

2. Provide a waterproof surface for your concrete. There are a number of commercial products designed to offer this type of protection. Some of these are plastic type coatings and others are admixtures applied to the surface of finished concrete. I have the name of a firm which specializes in admixture treatment and I will be happy to have them contact you, if you wish.

Perhaps other readers will care to recommend specific coatings for you to use.—H. P. Hayes.

New Questions

Wants Practical Explanation On New "Freon-12" Findings

QUESTION NO. 1084: Since early summer I have heard some discussion and seen brief news accounts regarding new thermodynamic properties of "Freon 12". Last week I read a report on the subject. I am unable, however, to determine what effect, if any, these new properties will have on my job as maintenance engineer. What will it mean to my employer in operating cost?

We operate about twenty "Freon-12" plants ranging from fifty to two hundred tons. The refrigeration is used for humidity and temperature control of industrial equipment as well as comfort cooling for personnel.—N.M.D., Chicago.

Proper Collection Point And Purger Instruction Sought

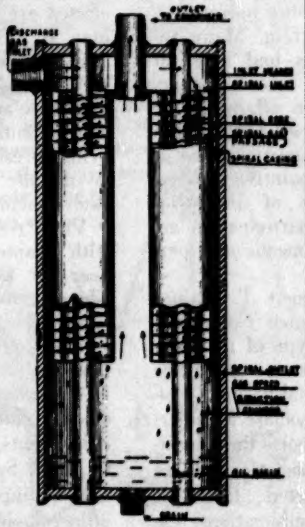
QUESTION NO. 1085: The problem of keeping an Armstrong Purger working properly was brought up with the report that the purger would fill with liquid ammonia soon, and stop functioning. The question was, "How can I fix it?" After some questioning several members reached the conclusion that there was nothing ailing the purger, but that it was receiving such a supply of pure ammonia vapor and so little noncondensable gas, that it automatically quit operating for lack of noncondensables to purge out. It was suggested that the purging be attempted from the top of the condensers instead of the top of the receiver, since air apparently was not collecting in the receiver under the present operating conditions.

Wants Drying Schedule for Cement-Insulation Mixtures

QUESTION NO. 1086: How long a period of drying time is required for a 10-inch layer of vermiculite (Zonolite) before refrigeration can safely be applied to the walls of a newly constructed ice-storage vault? It was reported that one such wall had cracked all the way down one side in earlier construction after the moisture had a chance to freeze, but the interval between pouring the Zonolite-cement mix, and application of refrigeration was not known. The Zonolite was poured between an 8" brick wall with vapor-seal inside, and a 4 inch Haydite wall without any coating on the inside.

(Continued on page 43)

"King Zeero"
OIL SEPARATOR



STOPS OIL FROM ENTERING CONDENSER RECEIVER AND LOW SIDE

Allows operation as was originally intended. Simple in operation — no parts to wear out — no screens, metal wool or any close screens to clog, raise discharge pressures and cut down capacity.

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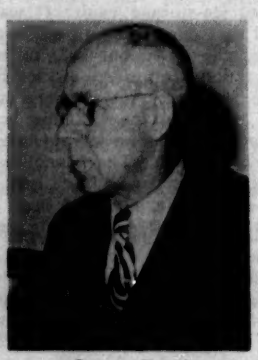
Industrial Membership Established by NAPRE at Annual Convention

ANOTHER membership classification has been opened to firms in the industrial refrigeration field, by delegate action at the 46th Annual NAPRE Convention held November 8-10, at the Ambassador Hotel, Los Angeles. An industrial form of membership has been added by amendment to the Association By-laws. Other amendments were also adopted, returning the immediate past president to the Association Board of Directors for a one-year term.



Leroy Etzel
San Francisco, Calif.
President NAPRE

Bert C. McKenna
Chicago, Ill.
1st Vice-pres. NAPRE

Frank L. Chase
New Orleans, La.
2nd. vice-pres., NAPRE

As customary, the membership elected its officers for 1956, and Leroy Etzel, superintendent of refrigeration, Pacific Fruit Express Co., San Francisco, was elected President. He succeeds Regis Gubser, vice-president for engineering, of California Consumers Corp., Los Angeles. Mr. Etzel is past-president of both San Francisco and Sacramento Chapters. He has been a director of the Association for eight years.

The delegates at this meeting also approved rules submitted by a special committee, for the administration of the H. G. Venemann Educational Loan Fund established at the 45th meeting held in New Orleans. Several chapters gained publicity for themselves, by presenting checks in substantial amounts toward this fund. With one exception, all contributions thus far have come from the membership, singly or through chapters. It is expected that the Industrial Membership will step up interest in the Fund, and initial loans will be made possibly in 1957.

Three types of certificates will be issued for Industrial Members of NAPRE. They are Sustaining, Sponsoring and Contributing, and are best described as permitting more participation by manufacturing, operating, or service firms, in the Association affairs, at the national, regional or local levels, respectively. Industrial members will have an opportunity to sustain, sponsor, or contribute to the NAPRE education program and the organization publications.

The new class of membership is the culmination of a desire on the part of the membership to provide a means of participation by refrgeration and air conditioning industry in the educational program. Many industry representatives had long indicated a desire to take more active part in education affairs of the association. The new membership does not permit firm participation in the elective or appointive offices, however. The types of industrial membership permit participation according to financial means and personnel limitations.

According to Emmett T. Quinn, Past President, Finance Committee Chairman, the new type of membership assists the finance committee in budgeting the annual national program. Active and Associate Membership income now supports the administration of the Association offices and is easily budgeted. However, other income from publications, exhibits and the like which are used for the education program, were unpredictable. Advertising and exhibit benefits which accrue to the new Industrial Member as a membership benefit, will now be paid in advance in a lump sum prior to the annual meeting. This arrangement should eliminate present annoyances to these interested parties, permit them to include the membership fee in their annual plans, and allow NAPRE to more efficiently plan the annual education program.

Other Officers Elected

Elected with Mr. Etzel for the 1956 term are Bert C. McKenna, Chicago, 1st Vice-president; Frank L. Chase, 2nd Vice-president; Leland Kenagy, Treasurer; and John G. Muller, Sgt.-at-Arms. Directors elected are Wm. Ray Burnett, Chairman, R. A. O'Neill, Hubert Branham, Tom Weatherford, Jr., Roy T. Burns, and John N. Mariakis. The officers also serve as Directors, and under the amendments to the By-laws, the retiring president is now a director, giving the Association a board of twelve members.

Vice-President McKenna, charged with chapter welfare, is chief engineer for Central Cold Storage Co., Chicago; Vice-President Chase, responsible for the Membership-at-Large program, is building superintendent for the Hibernia Bank Bldg., New Orleans. Treasurer Kenagy is chief engineer, Argentine & Armourdale Plants, Railways Ice & Service Co., and Sgt.-at-Arms Muller is district engineer of the same firm, both officers being at Kansas City.

Board Chairman Burnett is chief engineer, Royden Ice Co., Los Angeles. Other Directors affiliations are: R. A. O'Neill, district engineer and vice-president, Southern Texas Ice & Service, Inc.; Tom Weatherford, chief engineer, Texas Meat Co.,

Dallas; Hubert Branham, superintendent of refrigeration, Pacific Fruit Express Co., Pocatello, Roy Burns, building and safety engineer, City of Detroit; and John N. Mariakis, chief engineer, Claiborne Towers, New Orleans.

Chapters Awarded Charters

Highlight of a special Board of Directors meeting on November 7, was the awarding of charters to four new groups of refrigerating engineers who had petitioned recognition. These new chapters are located at Sioux City, Iowa, Denver, Colo., Tampa, Fla., and Greater Kansas City (Kans. & Mo.). Pro-tem officers named in their petitions are: Iowa, Gerald E. Willson, Pres., and Wm. T. Miller, Secy.; Colorado, Michael Bistranin, Pres., and Marcus A. Florida, Secy.; Florida, C. Scott Johnson, Pres., and Frank F. Guida, Secy; and Kansas, Leland Kenagy, Pres., and John G. Muller, Secy.

Prizes were also awarded the new chapters in the form of gavels. The President's trophy went to Denver; and the first and second vice-president's awards to Tampa and Sioux City, respectively. Denver had a clear-cut victory in the organization contest, but Tampa and Sioux City were so close the 2nd vice-president broke up a virtual tie with a third award.

Highlight of the Board meeting which followed the Convention was the selection of Detroit as the Association's convention site in 1956. Roy T. Burns, director, was chosen Convention Chairman. A preferential ballot by the delegates the previous day had left a clear cut decision for the Board's choice. San Francisco and Detroit had competed very keenly for the honors.

Membership Trophies Awarded

Tacoma, Washington, Chapter No. 2, took top honors from many larger chapters in the membership contest. They practically doubled their membership in 1955, and passed their companion chapter at Seattle in total members. For best overall achievement in membership they were awarded the Emerson A. Brandt Memorial Membership Trophy.

Top honors for most new members went to California No. 2, Los Angeles. They were awarded the large chapter trophy. In making the presentation, however, their president, R. Gubser, noted that they had room for improvement as New Orleans still exceeded them in total numbers.

Chicago again won the smaller chapter trophy for best percentage increase in members. It was the third time this chapter won, which automatically retires the trophy in their possession. Gubser commented on this award also, pointing out that Chicago was now in the large chapter competition with the conclusion of the 1955 contest. They would not be eligible for this trophy hereafter, and were fortunate to retire it.

New Membership Chairman for the 1956 term, is Geo. A. Paulick, Los Angeles. Mr. Paulick was Accommodations Chairman for the convention, and said to have been the choice of the Convention Chairman, Ray Burnett, because of his accommodating nature. However, the delegates who put his name in nomination, asserted that with most of the week's activities everyone seemed to "let George do it". These parties intimated that George would handle the difficult membership assignment in his same smiling, condescending and efficient manner.

Expand Education Staff

Upon the recommendation of Dean Harold P. Hayes, the Educational Chairman, the Board has des-

(Continued on page 50)

Bateman Makes Efficient Low Cost Ice Crushers For Every Purpose

Long life dependability is built into every Bateman Ice Crusher.

Heavy duty Monarch model 50. Grinds 50 pound block of ice in six to ten seconds. $235.00 less motor.

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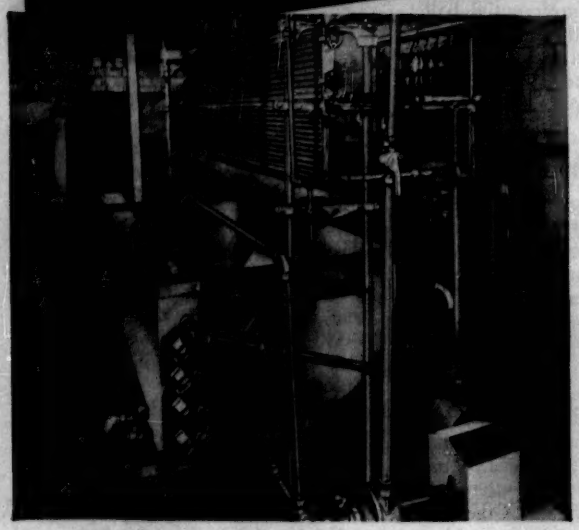
FOR SWEET WATER COOLING



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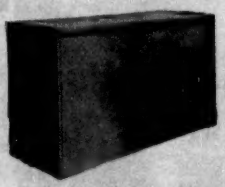
Let DOLE engineers show you how *Ice-Cels* can fit your needs. Write for "Ice-Cels in Action"—a pictorial brochure—or Engineering Catalog BPE.



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Ice-Cel UNITS

Ice Company Serves Gulf Fishermen

THE People's Ice and Cold Storage Company, Morgan City, La., has installed modern crushing and serving equipment for icing fish trawlers. With this equipment, a ton of crushed ice per minute can be poured into the hold of a boat. The service has been improved recently with the installation of the new Semco Ice Crusher. Manufactured by the Shipper's Equipment Manufacturing Company of Pharr, Texas, this crusher can average a production of 45 tons per hour, taking into consideration the time lost in the moving of boats and the changing of the hose from one hold to another.

However, speed is not the chief asset of this new machine. The main feature lies in the chunk size ice it produces rather than snow-flake type made by the older crushers. Among other advantages, this chunk ice will last longer, since it is in larger pieces, will keep the shrimp and other fish in better shape and fresh about twice as long and will not cause as much water to accumulate in the hold of the boat as does the snow type.

The average output of this machine since its installation has been ice for 30 to 35 boats in each 12 hour period. About 20 tons of ice is chuted into each boat.

Throughout the area's history, fishing has been a major industry. Prior to the middle thirties the chief demand for ice was made by the fresh water fisherman. Then came the discovery of the big shrimp in the gulf and trawler demanded not only ice in large quantities of 20 to 30 tons a boat, but obviously needed modern loading facilities. The People's Ice and Cold Storage met the demand with additional wharves, an overhead conveyor, 24 hour service and the modern blower-type crushed ice.

Next came the seismograph crews and then the production crews. Even with electric refrigeration the boats needed clear ice. And People's had it when they needed it. An added convenience to the sport fisherman and picnickers is crushed ice placed in the moisture-proofed bags sold at People's Ice and Cold Storage plant.

Frozen Food Nutrition Results to be Announced at Convention

FIRST results of the frozen food nutrition research program are expected to be announced in conjunction with the 1956 National Frozen Food Convention next January, it was announced by Lawrence S. Martin, secretary-manager of the National Association of Frozen Food Packers. NAFFP is sponsoring the five-year $250,000 study into the nutritional composition of all frozen vegetables, fruits, and juices regularly found in retail stores.

This will be the first authentic report ever issued on this subject by an independent research organization, and if complete results are as favorable as early reports indicate, the packers believe this program will clear any remaining doubts as to whether any nutritional values are lost in the freezing process. The research is being conducted by the Wisconsin Alumni Research Foundation, Madison, Wis.

The decision to release the report during the convention was made by the NAFFP board of directors at its annual meeting in Washington October 14. Aside from the nutrition report, the directors approved a convention program which should answer important questions concerning the much talked-about process of radiation sterilization of foods and the retail freezer case bottleneck.

The 1956 National Frozen Food Convention will be held at the Waldorf-Astoria Hotel in New York from January 29 through February 2.

Transportation Problems Reported to Frozen Food Directors

FROZEN FOOD packers are confronted with many problems in the transportation field, according to a report presented by T. C. Borden to the Directors of the National Association of Frozen Food Packers at their meeting in Washington on October 14. Mr. Borden is Traffic Manager, Exchange Lemon Products, Corona, Calif., and Chairman of the NAFFP Transportation Committee. In his report, he reviewed the NAFFP Committee's efforts to improve rates and services for shippers of frozen foods. In particular, he cited pending decisions on important subjects such as detention charges on mechanical cars, proposed increase in refrigeration charges, classification status of frozen foods by motor carriers, question of loading minima vs cubical capacities, repacking in transit, and l.t.l. shipments, particularly by motor carriers.

Mr. Borden also reported on the activities of the Association's Transportation Equipment Committee. Principal point of interest in this report was the anouncement that 1077 mechanical refrigerator cars are now in service and another 930 are being constructed. Truckers also are improving equipment, it was reported, but they still have far to go before frozen food shippers will be satisfied. Mr. Borden reported on equipment matters in the absence of John Podmore, Minute Maid Corporation, Chairman of the NAFFP Transportation Equipment Committee.

Insurance Publication Cites Synchronous Motor Failure

AN ANALYSIS of synchronous motor failures is made in a 10-page article in "The Locomotive", quarterly publication of The Hartford Steam Boiler Inspection and Insurance Company, by J. F. Martin, Assistant Chief Engineer, Machinery Division. The paper is based on studies of claims made to the firm in the period 1952-1954 inclusive.

Conclusions drawn by Martin are that the causes of the vast majority of synchronous motor failures are well within the control of supervisors and operators. A well planned and properly supervised preventive maintenance program will pay dividends in materially reducing unscheduled outages of electrical equipment vital in plant production.

Causes of the failures are broken down by the author under principal motor component subheadings, and remedies suggested. The article is written in easily read and understood style, which operating men will welcome as a usable item to their engineering literature. Copies of "The Locomotive" Vol. 50, No. 7, July 1953, containing this article is available free of charge to owners and/or operators of power machinery.

New Gas-ice Plant Planned

ASSOCIATE Diversified Enterprise Ltd., a company incorporated in Alberta, Canada and with head office in Penticton, is negotiating contracts with Gas-Ice Corporation (Canada) Ltd., whereby Associated will build a natural carbon dioxide plant at Consul, Sask. Plans call for a housing project of a trailer town type, one mile of high pressure pipeline, roads, a liquid CO_2 plant and gas-ice plant together with other refining and power installations. The initial program will involve approximately $250,000 and plans allow for additional equipment up to $500,000 in the first of a series of plants anticipated.

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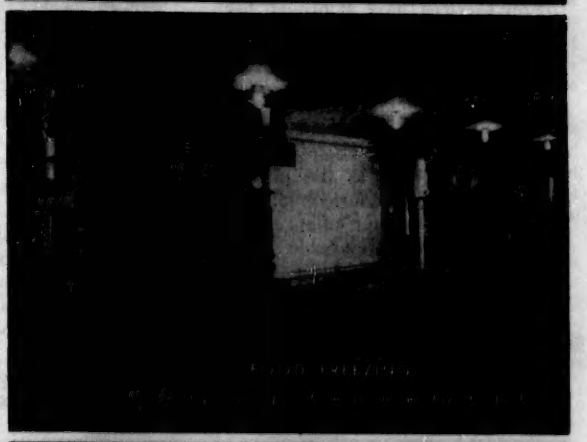

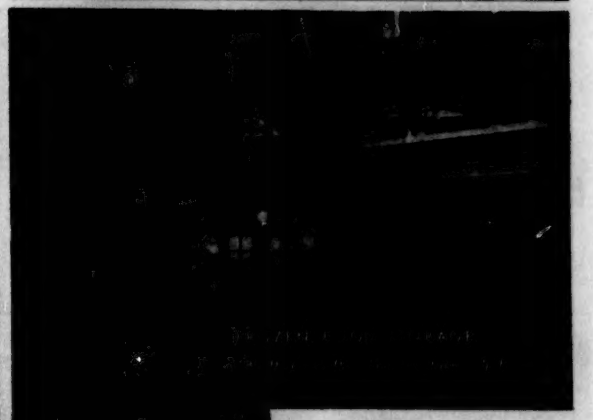

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Dressed Beef Packing Plant Expands Adds Refrigeration Facilities

THE SECOND and third installations of refrigeration equipment are being completed at the Sioux City (Iowa) Dressed Beef, Inc., plant. Completed at a cost of $450 thousand, in September 1954, this modern packing plant has twice diversified and expanded its operations. Each time it has involved additional refrigeration facilities.

This beef plant structure is a two-story building. All process, operating and handling is accomplished on the first floor. Beef killed one day is shipped the next with present facilities. Large longer term storage or freezing facilities have not been constructed, since transport, storage and freezer services, have at present been adequate.

Offices and beef dressing rooms are located on the second floor. The office area is located directly over the kill floor where all operations can be seen through sealed windows in the office. Every room in the plant is hooked up with an inter-communicating system so that immediate contact with all personnel is possible. In addition, the plant has its own laundry and well water supply.

Year Old Plant of Sioux City Dressed Beef, Inc.

Room Evaporators

The beef chilling room in the Sioux City plant is 96 × 54 ft. Vilter supplied three 13,000 cfm air units capable of better than 12 tons of refrigeration each. Like all forced air units in this plant, these brine-spray units are of heavy hot dipped galvanized finish, after fabrication.

Air is discharged from the blower unit vents into a plenum chamber above the rail beams (See Fig. 1). The bottom of the plenum chamber is made up of 1 × 4-inch boards, dipped in boiled linseed oil and spaced ¼ inch apart. This arrangement gives equal distribution of the air in all parts of the room and at low velocities. The chill room holds 400 carcasses, and even when loaded with hot beef, the temperature is reported to have never exceeded 35 F. The chill room temperature is maintained by a compensated back pressure regulator with potentiometer thermostat and electrically operated by a Modutrol motor.

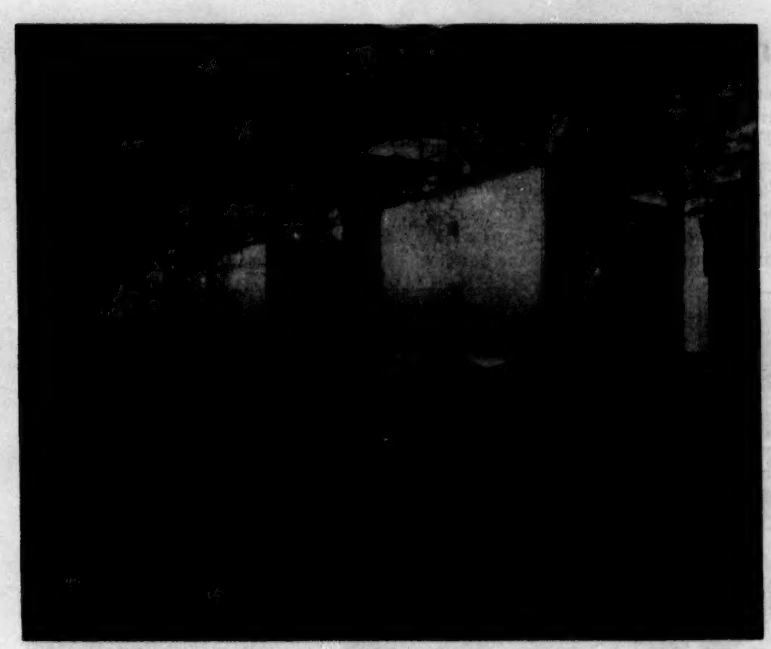
For the offal freezer Vilter supplied a 10-ton air unit; in the offal cooler, a Vilter 3-ton high temperature unit was supplied; and in the hide cellar, two 1½-ton each Vilter ceiling type units with thermal, operated suction and liquid stop valves, were supplied. Each of these latter two is equipped with a ¼ hp motor.

Compressors installed in the machine room include one 4½ × 4½ inch VSA booster ammonia compressor and two 6-cylinder VMCs, by Vilter. Capacity of the latter two produces a total of 120 tons. Additional equipment includes: one Vilter 20 in × 8 ft suction line Vaporiter (a liquid knockout drum or accumulator); two 20 in × 16 ft horizontal enclosed, 12-pass shell and tube ammonia condensers; and one 24 in × 16 ft ammonia receiver.

The Vaporiter handles the high pressure suction line from the coolers and the discharge from the 4½ × 4½ inch vertical, which is used as a booster on the freezers. The two 6-cylinder VMCs take the full load from the Vaporiter. Back pressure to the VMCs varies from 30 to 35 lbs. during the day and on weekends around 40 to 45 lbs.

All the equipment listed was installed in 1954. Since then Vilter has provided the following for the two new additions: Two horizontal 20-ton Pakicers complete with equipment for making No. 4 briquettes, 5½ × 3½ × 3 inch brick, weighing 1.6 lbs; approximately 23 per cu. ft.; two 6-cylinder VMC ammonia compressors; two 20 in. × 16 ft. ammonia condensers; one 20 in. × 16

These two 6-cylinder VMC ammonia compressors handled almost the entire load when Sioux City Dressed Beef, Inc. began operations in September, 1954. Since then four more 6-cylinder VMC's, including one booster, have been ordered to handle the company's growing operations.



Three Vilter air units service a chill room at Sioux City Dressed Beef, Inc.

ft. ammonia receiver with valves and gauge glass assembly; one ammonia regenerator; one ammonia filter and solvent injector.

In the second addition these items of equipment are being placed: one 6-cylinder VMC ammonia Booster compressor to be driven at 1200 rpm; one 6-cylinder VMC ammonia compressor to be driven at 900 rpm; One Vilter 20-inch Vaporiter with ammonia float control and connections.

Question Box

(Continued from page 39)

Descaling Lines With Acid

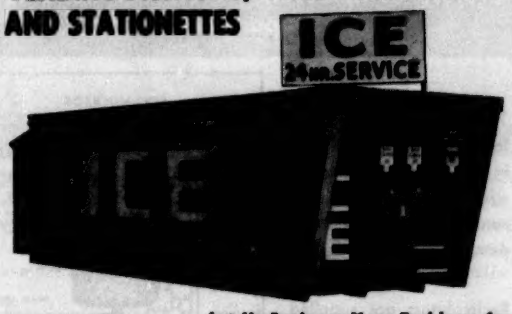
QUESTION NO. 1087: What are recommended practices for descaling compressor-jacket cooling water lines, by the inhibited acid method? What precautions should be made for foaming? Is it hydrogen gas developed from this cleaning process? If so, what precautions should be taken against fire, explosion? What is the recommended use of tri-sodium phosphate or Zeolite treated water to reduce scaling?

Anti-Freezing Methods For Winterizing Water Coils

QUESTION NO. 1088: In preparation for winter, we have a job of draining and protecting about one hundred large chilled water coils. These coils are located in central ventilating systems. Our winters are very cold and these coils, at times are subject to freezing temperatures.

Every spring when we refill we usually find a number of leaks caused by pockets of water freezing and splitting the coil. I would like some suggestions on protecting these coils. —N.M.D., Chicago.

PERFECTION MAKES COMPLETE AUTOMATIC VENDING STATIONS, VAULT VENDORS AND STATIONETTES



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Ask about TIME PAYMENT PLANS.

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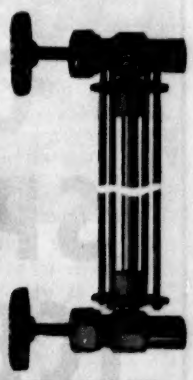
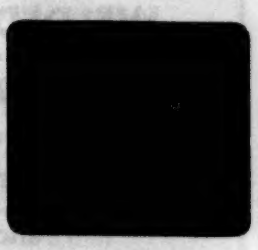


ALL-STEEL GAUGE SETS with automatic shut-off of liquid in case of glass breakage.

RELIEF VALVES for Ammonia and Freon. Positive relief action. Pressures from 75 to 300 lbs.

Largest line of Ammonia All-Steel Bar Stock Valves in the industry. Completely Cadmium plated.



STOCKED BY LEADING JOBBERS

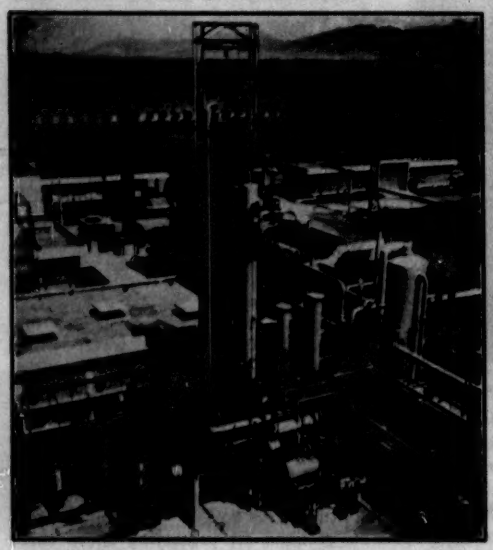
Write for Catalog and Prices. **CYRUS SHANK CO.** 4650 West 12th Place Chicago 50, Illinois

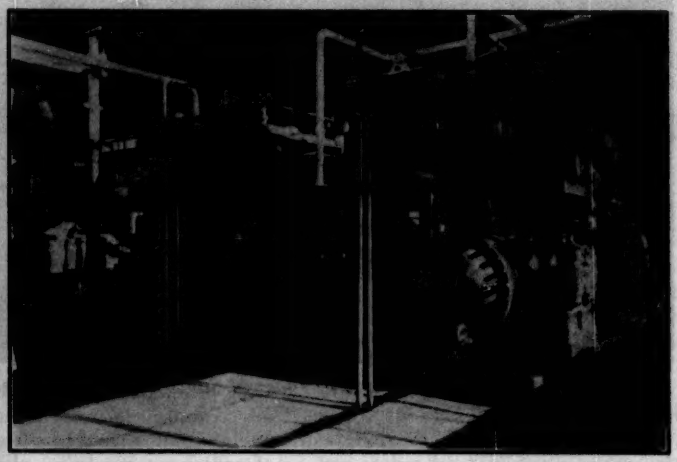
Mexican Ammonia Plant Makes Fe rtilizer

GUANOS y Fertilizantes de Mexico S. A., the largest fertilizer plant in Latin America, produces 200 metric tons of ammonia sulphate daily and 200 metric tons of superphosphate.

Two Frick 4-cylinder, 11 x 10-in. ammonia compressors supply refrigeration for two purposes in the ammonia synthesis process at Guanos y Fertilizantes: a portion of the load consists in cooling a circulating solution of cuprous ammonium formate, which is an absorbent for removing carbon monoxide and carbon dioxide from synthesis gas; the balance of the load is taken up in cooling high pressure synthesis gas to condensing temperatures, thus producing a portion of the liquid ammonia output of the plant.

A 42 inch by 16 feet ammonia receiver, and two 38 inches by 14 feet vertical ammonia condensers, with a capacity of 157 tons refrigeration each, comprise the liquefaction stage.





Left: Large fertilizer plant at Cuautitlan, Mexico, producing 400 metric tons daily. Above: Frick 4-cylinder 11x10 compressors and a booster machine.

OHIO SPECIAL ICE CANS

WELDED – RIVETED ICE CAN GRIDS

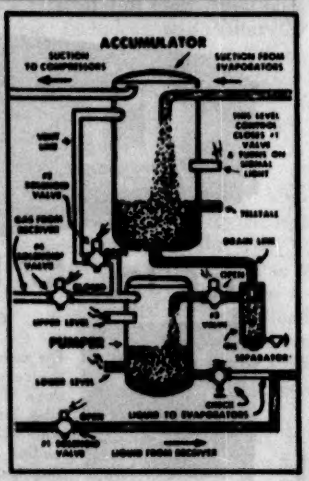
Industrial Trucks and Trailers

THE OHIO GALVANIZING & MFG. CO.
NILES, OHIO

Watkins RECIRCULATORS
Protect Compressors, Allow Full-flooding In Evaporators

The only patented system for catching excess liquid in the suction line and recirculating it to the evaporators, using no mechanical pumps.

Recirculators are supplied complete with oil separator, factory-wired electrical control panel, all valves and fittings. Manufactured for any tonnage, any suction pressure, any refrigerant.



Write for Bulletin R-2, Price List PR-2

J. E. Watkins Co.
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FREEZER UNITS, HOT-GAS DEFROST SYSTEMS, LIQUID CHILLERS, CONDENSERS, FLASH GAS ECONOMIZERS, INTERCOOLERS, RECEIVERS, PURGERS

EQUIPMENT FOR MORE ECONOMICAL OPERATION

Insulation in Reverse Keeps Ground Frozen at Thule Air Force Base

WHEN the U.S. Engineers were building the huge Air Force base at Thule, Greenland, it was necessary, of course, to insulate all hangars and buildings against the arctic cold. However, another insulating problem was that of keeping the building heat from reaching the frozen "permafrost" layer under the building. In this case, the insulation performed a unique task; it literally helped keep the buildings from falling down!

"Permafrost" is the layer of soil or rock whose temperature has been below freezing for years. It exists at varying depths and when frozen possesses good compressive strength. However, it loses strength when thawed and will not support structures. When building heat melts the ice, the building settles and collapses. Improper use of this permanently frozen subsoil has caused more building failures in the far north than all other causes.

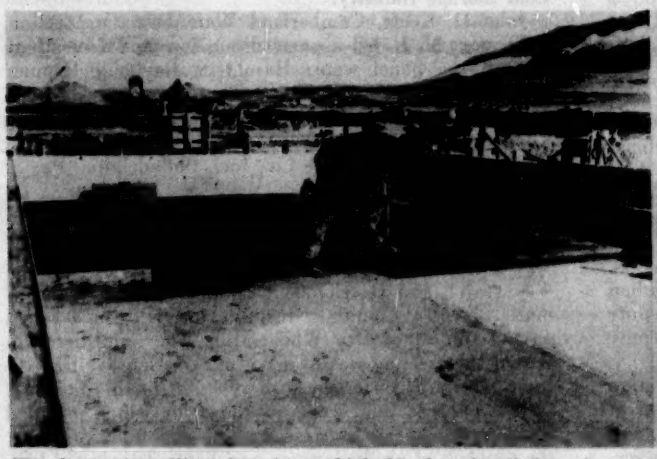
Foamglas in Floor

To help meet this problem, four-inch blocks of Foamglas cellular glass insulation were incorporated in the floor slabs. The insulation, a product of the Pittsburgh Corning Corporation, has a compressive strength of over seven tons per square foot. This allows it to bear the weight of the concrete wearing surface as well as that of moving gasoline tank trucks and huge bombers and transport planes. Its sealed cellular structure makes it impervious to any moisture which might cause insulation to deteriorate under these conditions.

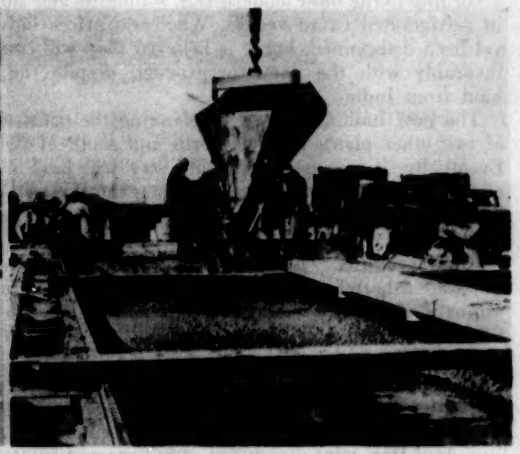
Cube Ice In Colored Bags

WHEN Tom Carroll, manager of the Ice Delivery Company of Wichita, Kansas started selling five-pound packages of cube size ice through retail stores, he came up with a beautiful multi-colored bag. The paper is white. The name "Redy-Pak" shouts in yellow letters on a deep blue background with red trim. Buyers can almost hear the ice tinkle in the beverage glass in the illustration that forms an important part of the advertisement.

But that's only part of the story. Tom made up handouts which are exact duplicates of the front of his bag, and he keeps each store that handles his ice supplied with these handbills. The advertising on the bag and on the handout does an excellent job of selling the product. The name of the store is carried on the bottom of the ad supplied to each store.



Workmen installing four-inch thick blocks of cellular glass insulation in floor of hangar at Thule Air Base. The insulation helps keep heat from "defrosting" frozen "permafrost" under building. Heat would cause subsoil to lose its compressive strength allowing the building to settle.



Concrete wearing surface being poured over Foamglas insulation in foundation of structure at Air Force's Thule Base. "Insulation in reverse" helps keep subsoil frozen to provide solid footing for building.

K. G. Brown Mfg. Co., Inc., Mattituck, N.Y.

PRESENTS:

The Most Modern Automatic Ice Cube Vendor.

- **Dispenses Cube, crushed, party and block ice**

- **Ready for immediate operation.**

The 8' x 10' station pictured here, vends more than 200 ten-pound bags.

Write today for complete details on this Double Unit and other sizes and models.

India Shrimp Industry Plans Shipments to United States

THE NEWLY formed shrimp and fish industry of India, organized with U.S. assistance, plans to enter the $140 million United States shrimp market. This announcement was made at a press reception held by the Consulate General of India, where the initial shipment of shrimp made its debut.

The shrimp, which are caught off the Malabar Coast of Southwest India in special trawlers originally put at the disposal of the Indian Government by the Technical Co-operation Mission of the U.S. to India, are processed in a modern plant managed by American technicians, who were sent there for that purpose.

According to Gene Garvin of Amerindo Trading Corp., who recently returned from India, U.S. consumption is between 250 and 300 million pounds a year, 40 millions pounds of which are imported. Mexico, the principal exporter, supplies approximately $35 million worth of shrimp annually. The Indian shrimp project, he said, will initially produce about three million pounds a year. The plant is capable of producing 10,000 pounds of processed, frozen shrimp daily, with allowances made by architects for doubling the capacity.

The shrimp, delivered directly to the plant, located near Calicut are cleaned, processed, packed and blast-frozen according to the most modern U.S. standards and shipped in refrigerated cargo vessels. Wholesale prices have not yet been determined, but it is believed they will compare favorably with the domestic product, despite the long haul from India.

The new Indian industry is planning the construction of two other plants on sites north and south of Calicut. Eventually, it was noted, the industry will have a fleet of 20 modern trawlers operating along the Western coast line, where the principal source of supply current is located.

Guiding spirits behind this new venture are Dr. B.N. Chopra, fisheries development advisor to the Indian Ministry of Food and Agriculture, Dr. D. Bhatia, deputy fisheries development advisor, and Shri V. John, deputy director of fisheries, Government of Madras.

The new freezing plant was leased to the new operation under the direction of Shri P.K. Palaniappan, director of industries and commerce of the Madras Government, and Shri Arul Das, joint director of industries and commerce. Technical assistance and financing were provided by the Amerindo Trading Corp., in association with George D'Sa, India's leading expert on refrigeration and president of Malabar Fisheries of Calicut, India.

Amerindo also was responsible for sending to India specialized shrimp trawler skippers who will operate with local Indian crews.

Market Authority Plans New Refrigerated Warehouse

A REFRIGERATED warehouse development costing 10 to 12 million dollars on part of the site of the Genesee Valley Regional Market in the Town of Henrietta, N. Y., was announced by Ray F. Brayley, general manager of the market authority.

Approximately 58 acres of land fronting on the west side of Clay Road is to be leased to the Regional Market Development Corp. headed by Herbert W. Pfeiffer and Louis Brisink. Immediately after the first of the year, weather permitting, the corporation plans to begin erecting warehouse buildings with storage space of approximately one and one-half million square feet.

North Atlantic Warehousemen Meet

MORE than 50 refrigerated warehousemen from the Middle Atlantic and Northeastern States attended the annual Fall Meeting of the North Atlantic Chapter of the National Association of Refrigerated Warehouses held October 5-7 at the Shawnee Inn, Shawnee on the Delaware, Pa.

Re-elected to the chapter offices for 1956 were Chairman P. D. Burrill, Quincy Market Cold Storage & Warehouse Company, Boston, Mass.; Vice Chairman John J. Byrne, The Manhattan Refrigerating Company, New York, N. Y.; Secretary Alex MacTaggart, Lackawanna Cold Storage, Scranton, Pa.; Treasurer A. Oakley, Jr., Hudson Refrigerating Company, Jersey City N. J. The 1956 Chapter Executive Committee includes these officers and Immediate Past Chairman Carleton Peacock, Quaker City Cold Storage Company, Inc., Philadelphia, Pa.; Raymond C. Cash, The Upton Cold Storage Company, Rochester, N. Y.; and A. Gordon Janney, The Baltimore Cold Storage Company, Baltimore, Md.

Thomas A. Fulham, Chairman of the Board, Fulham Bros., Boston, Mass., discussed the "Present Day Fishing Industry."

Harley Emery, Chief, Program Analysis Division, Live Stock and Dairy Branch, U.S.D.A., spoke on C.C.C. sales policy on Dairy Products and How It Affects the Cold Storage Industry.

John D. Keefe, Cumberland Warehouse Corporation, Bridgeton, N. J., led a panel discussion on safety. Members of the panel were: Harold S. Raybould, Quincy Market Cold Storage and Warehouse Company, Boston, Mass.; Charles Cunnigham, Merchants Refrigerating Company, New York, N. Y.; and Carleton Peacock, Quaker City Cold Storage Co., Inc., Philadelphia, Pa.

Dry Milk Products

A SYMPOSIUM was conducted recently by the Research and Development Command of the Quartermaster Food & Container Institute for the armed forces on the subject of Dry Whole Milk. The immediate object of the meeting was to make information available to those who are concerned with research in this field.

The purpose and scope of the Symposium included latest developments in research on dry milk products, the problem of producing non-perishable dehydrated beverage milk, the preparation and utilization of dehydrated products in the field, improving and extending the number of dry milk products.

Printed proceedings of this symposium are available from The Quartermaster Food and Container Institute for The Armed Forces, 1819 West Pershing Road, Chicago 9, Ill.

Processed Egg Production

LIQUID EGG production during September for immediate consumption, freezing and drying totaled 9,012,000 lbs., compared with 9,752,000 lbs. in September last year and the 1949-53 average of 11,896,000 lbs. Dried egg (egg solids) production during September totaled 1,159,000 lbs., compared with 953,000 lbs. during September last year and the average of 1,692,000 lbs. Frozen egg production during September totaled 5,328,000 lbs., compared with 7,132,000 in September last year and the 1949-53 average of 7,224,000 lbs. Frozen egg stocks decreased 26 million lbs. in September compared with 22 million lbs. last year and the average decrease of 23 million lbs.

Libby Expands Frozen Food Production

IN A move designed to meet the growing demand for frozen specialty items and their built-in kitchen conveniences, Libby, McNeill & Libby, has announced plans for a major expansion of its production facilities.

According to Charles S. Bridges, president, Libby has acquired a plant in Lafayette, Ind., and is converting a portion of its frozen vegetables plant in Houston, Del., for the production of specialties. The company's frozen orange and lemon juice plant in Ocala, Fla., is being enlarged and plans are being drawn for another zero storage warehouse at the frozen fruits and vegetables plant in Mt. Vernon, Wash.

A wholly-owned Libby subsidiary, Dickinson Co., has leased the building and purchased all machinery and equipment in the Lafayette plant, which was completed about two months ago by Prepared Foods, Inc. Libby plans to operate the plant, which has about 15,000 square feet of floor space, on a year-round basis to produce frozen chicken, turkey, beef and fruit pies. Freezing and storage are handled at the adjacent plant of Continental Freezers.

In addition to converting a portion of the Houston, Del., plant to the preparation of frozen specialties, Libby is installing its own freezing equipment and zero storage facilities there.

The capacity of the Ocala, Fla., plant is being increased by one-third, and the storage capacity is being trebled.

Mobile Seafoods Plant Adds New Refrigeration

THE STAR Fish and Oyster Company, located at the Alabama State Docks in Mobile is installing two new shell and tube condensers in its ice plant which produces ice for its own consumption. The new condensers, by York, are replacing the miles of ammonia pipes which have been in service over 25 years. The plant production is 24 tons of ice a day.

Star Company, largest shipper of red snapper and noted for its contribution to the snapper industry is completing 55 years of business this year. It has in its fleet seven schooners and an eighth under construction in Biloxi, Miss. On their fishing trips, the boats take an average of 120 ice blocks, weighing 400 pounds each. With three storage warehouses and five freezer rooms, the company has a storage capacity of 100,000 pounds. It carries in stock in its freezer rooms a wide range of over 100 different items, including delicacies imported from Norway, Canada and Japan.

COMING CONVENTIONS

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS
December 1-3, 1955
Traymore Hotel, Atlantic City, N. J.
R. C. Cross, Executive Secretary

DELTA STATES ICE ASSOCIATION
December 4-6, 1955
Buena Vista Hotel, Biloxi, Miss.
Mrs. Edna Vaughan, Secretary

SOUTHWESTERN ICE MANUFACTURERS ASSOCIATION
December 11-13, 1955
Gunter Hotel, San Antonio, Texas
P. A. Weatherred, Secretary-Counsel

MISSOURI VALLEY ICE MANUFACTURERS ASSN.
January 9-10, 1956
President Hotel, Kansas City, Mo.
V. A. Esphorst, Secy-Treas.

SOUTH CAROLINA ICE MANUFACTURERS ASSN.
January 23-24, 1956
Wade Hampron Hotel, Columbia, S. C.
Margaret I. Kinder, Secretary

NATIONAL ASSOCIATION FROZEN FOOD PACKERS
January 29-February 2, 1956
Waldorf-Astoria Hotel, New York, N. Y.
Lawrence S. Martin, Secretary-Manager

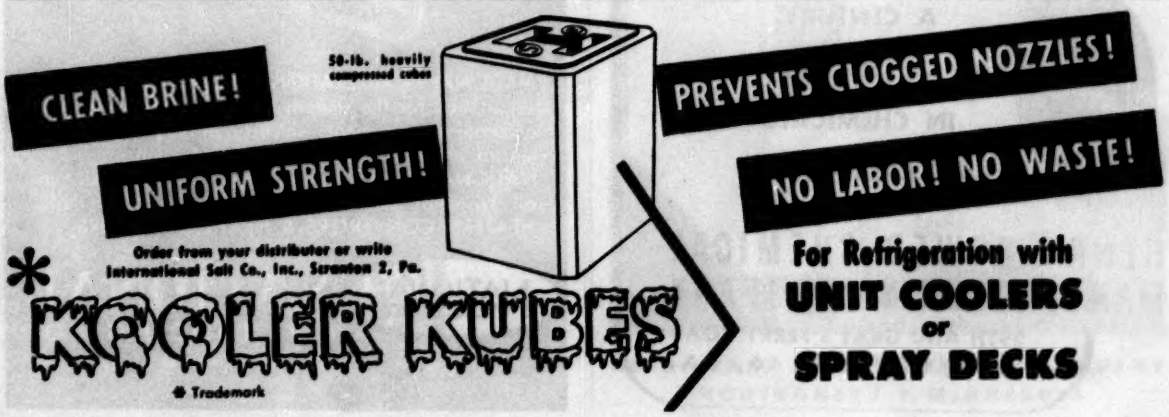
GEORGIA ICE MANUFACTURERS ASSOCIATION
February 21-22, 1956
Dinkler Plaza Hotel, Atlanta, Ga.
Mildred Nichols, Secretary

SOUTHERN ICE EXCHANGE
February 21-22, 1956
Dinkler Plaza Hotel, Atlanta, Ga.

NORTH CAROLINA ICE ASSOCIATION
March 12-13, 1956
Sir Walter Hotel, Raleigh, N. C.
Lewis H. Powell, Secretary-Treasurer

AMERICAN WAREHOUSEMEN'S ASSOCIATION
April 9-13, 1956
Hotel Statler, Los Angeles, Calif.
Wm. Dalton, Secretary

NATIONAL ASSOCIATION REFRIGERATED WAREHOUSES
April 9-13, 1956
Hotel Statler, Los Angeles, Calif.
Wm. Dalton, Executive Vice President



NAPRE Convention

(Continued from page 41)

ignated a Director to take overall supervision of the association program. Past President and Director Regis Gubser was handed the assignment by unanimous action of the Board.

Division of responsibility under Gubser will be as follows: Hayes — supervision and direction of the Question Box, liaison with Individual Members, and program research; Guy R. King, Vice-chairman — preparation of Instructor's Manuals and assistance to the chapters with their programs and annual calendars.

A third division of work will be handled by another Vice-Chairman to be appointed by Gubser. This party and his sub-committee, will prepare examinations and set up administrative procedure for conducting exams and awarding NAPRE Certificates in Proficiency in Practical Refrigerating Engineering. It is expected that the committee will announce a program along these lines during the 1956 term.

A number of technical and other papers were presented, most of them followed by discussion. The following were summarized in November: "Automatic Ice Plants," Robert F. McKee; "Refrigerated Cargo Ships of the U. S. Navy," F. W. Pardoe; "Air Conditioning of Public Buildings," "Color Coding of Pipe and Conduit," R. W. Davis.

Solar Energy May Produce Refrigeration

(Continued from page 2)

survival in wind storms or hail storms. The cost of plastics may well depend on the ability of the plastics to retain their strength and transparency under severe weather conditions." Despite these problems, Daniels said that once they have been worked out "we may rest assured that there is an ample supply of solar energy to meet all our needs."

He added that mankind is completely dependent upon the sunshine of the present for food, and upon sunshine of the past, in the form of coal, oil and gas, to run machines needed by civilization. "We have been so satisfied that only recently have we begun to explore the possibility of getting more work and more comfort by the direct tapping of our current supply of sunshine. "We are asking now," Daniels says, "how can we do it?"

News of People

Strong Joins City Products Board of Directors

THE election of Harry E. Strong to the board of directors of City Products Corp. Chicago has been announced by Wm. J. Sinek, president. Mr. Strong is vice-president in charge of City Products Corporation's entire dairy division, and president of Midwest Dairy Products Corporation, a subsidiary of the parent company, with headquarters in Memphis, Tenn.

Identified with the dairy industry for more than forty years, Mr. Strong was instrumental in forming the original Midwest Dairy Company in 1927, at DuQuoin, Ill., and expanding its operations into Missouri, Arkansas, Kentucky, Tennessee, Mississippi and Louisiana. When the company was sold in 1947 to City Products Corporation, Mr. Strong came to the parent company as president of the Midwest operation. Today the dairy division of City Products includes more than fifty plants and distribution branches.

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BB BRAND
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Anhydrous Ammonia
CELEBRATING
A CENTURY
OF SERVICE
IN CHEMICALS
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HENRY BOWER CHEMICAL MANUFACTURING COMPANY
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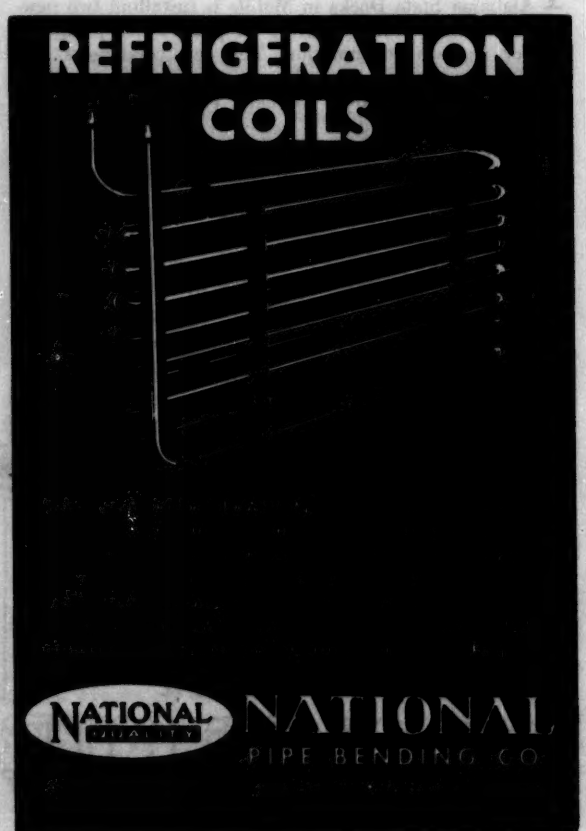

Dutch Use Frozen Cream

SOME Netherlands buttermakers have come up with a new answer to the old problem shared by all dairy-surplus countries — the problem of butter storage. Finding that some of their old customers in other countries objected to cold storage butter, they tried freezing cream instead, and making butter from it as the need arose. The 12 dairies that make the experiment say that butter churned from frozen cream not only tastes like fresh butter, but has a higher Vitamin A content than fresh butter, and is easier to spread.

Plastic Insulation in New Refrigerator Car

A FEATURE of a new railway refrigerator car designed by General Motors is the use of polyurethanes, one of the newer plastics, as an insulating material. A custom designed machine mixes and injects its 'Stafoam" plastic between the inner and outer shells of the car. This takes two hours. A chemical reaction causes the material to foam, completely filling all voids and cavities and welding itself to the shells as it rapidly becomes rigid.

Although the Stafoam compound is more expensive than other insulation, the fact that it takes less time to apply than competing materials keeps ultimate costs at the same level. Among the advantages claimed are that corrosion of hidden metal parts is curbed.

Fire Damages Ice Plant

A FIRE which smoldered during the afternoon after workmen apparently had dropped molten metal on a roof beam damaged the Fresno-Madera Ice Company, Fresno, Calif., causing an estimated $12,000 damage to the roof before it was brought under control. The fire started in a room where metal rails had been cut with a torch that afternoon.

Cold Storage Unit for Libby

CONSTRUCTION of a cold storage warehouse in Mount Vernon, Wash., is being planned by Libby, McNeill & Libby. The plans call for an 18,000 sq. ft. structure with tilt-up walls, slab on grade, bowstring trusses, and insulation. General construction and insulating contracts are proposed.

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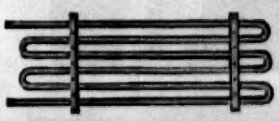
REMPE CO.
Founded 1890

PIPE COILS—FIN COILS
FOR REFRIGERATION, AIR CONDITIONING, HEATING

Coils and Bends of any Metal, Size or Design. Engineered to your requirements. Designed and built for longest life and the least maintenance.



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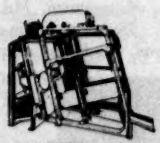
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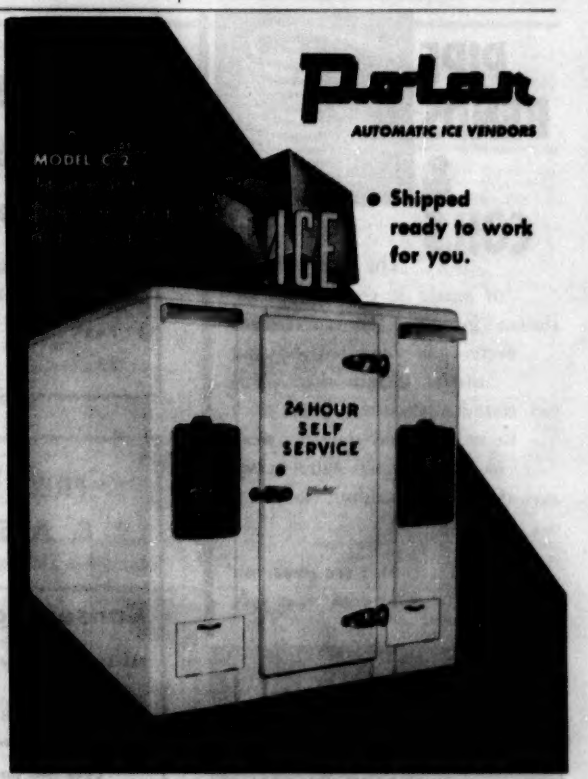
AUTOMATIC ICE VENDORS



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REFRIGERATION ENGINEERING COMPANY
MONTGOMERY • MINNESOTA

MANUFACTURERS' NEWS

Lovett Advanced by Pittsburgh Corning

THE appointment of Walter Lovett as manager of its newly created Technical Service Department is announced by the Pittsburgh Corning Corp., Pittsburgh, Pa. The department was established to provide prompt technical assistance to customers and prospects for its two products, PC glass blocks and Foamglas. In addition, it will coordinate information from Pittsburgh Corning's research and development divisions, and will review and prepare technical information for the company's sales engineers.

Walter Lovett

Mr. Lovett, who is a graduate of the University of Pittsburgh and a former assistant professor in Civil Engineering at the University, is a member of the Professional Engineers Society and the American Society for Testing Materials. He has been associated with Pittsburgh Corning since 1950. The department will be located in the firm's headquarters office, One Gateway Center, Pittsburgh 22, Pa.

Trane Expands

AN EXPANSION project to cost more than one million dollars at its LaCrosse facilities has been announced by the Trane Company, La Crosse, Wis. manufacturers of air conditioning, heating, ventilating, and heat transfer equipment. The program involves two additions totaling 90,600 square feet to the company's plant No. 4. When completed the addition will make the plant the largest of the firm's LaCrosse unit. At the same time the company disclosed plans for a $300,000 expansion that will add 30,000 square feet to its plant at Scanton, Pa.

The LaCrosse addition will be used primarily to provide increased production space for the manufacture of centrifugal refrigeration compressors, packaged water chilling units and unit air conditioners. The Scranton expansion will provide facilities for the production of year round room air conditioners plus expanded facilities for manufacturing heating products.

Wright New Director of Gifford-Wood

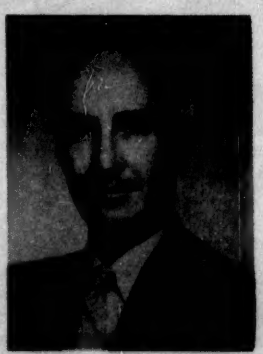
DONALD E. WRIGHT, Sorzano, Antell & Wright, Management Consultants, has been elected to the Board of Directors of the Gifford-Wood Co., Hudson, New York, according to Orlan A. Johnson, President.

Donald E. Wright

The Company, founded in 1814, has long engineered and manufactured material handling systems for industry and has recently added a line of automatic kitchen machinery for restaurants, hotels and institutions. Mr. Wright is a specialist in personnel management with 20 years of experience in metal-working industries.

Jamison Appointment

THE appointment of Edward A. Nixon as chief engineer of the Jamison Cold Storage Door Company, Hagerstown, Md. has been announced. Before joining Jamison, Mr. Nixon was chief engineer



Edward A. Nixon

of the Marine Manufacturing & Supply Co., New Brunswick, N. J. He was previously engaged in research and development for the U. S. Navy, and associated with the Newport News Shipbuilding Co.

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The "know-how" of nearly 40 years of specialization in pipe fabrication back every job produced by our master metalworkers. You can confidently entrust your work to us. . . even stainless steel, or up to 6-inch extra heavy. Complete welding facilities.

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Industrial Power Plants

Refrigeration and

Cold Storage Warehouses,

Reports, Appraisals and Management

Brown New President General Chemical Div.

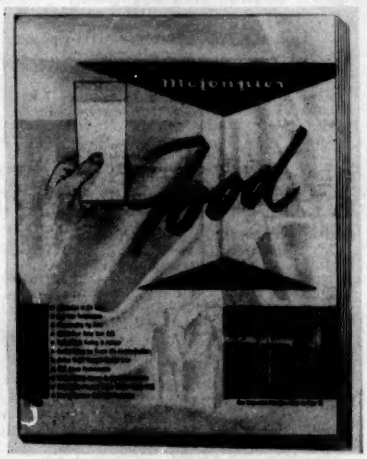
CHESTER M. BROWN has been named president of General Chemical Division, Allied Chemical & Dye Corporation, it was announced by F. J. Emmerich, president of Allied Chemical. Mark M. Biddison, who has headed that Division Since 1951, will continue his association with the company functioning in an advisory capacity and handling special assignments.

Mr. Brown began his career with General Chemical Division as a production trainee at the East St. Louis Works, in 1929. He was works superintendent in 1938 at the time he was transferred to the executive headquarters of the Division in New York, where he was successively assistant works manager and assistant production manager.

CATALOGS AND BULLETINS

Bulletin Offers New Production Ideas

ANOTHER number of "Food" magazine, published by Mojonnier Bros. Co., Chicago, one of the nation's pioneer manufacturers of stainless steel dairy and food processing equipment, is now available to readers. It's interesting, informative, containing a number of case histories on how plants all over the U. S. profitably solves problems of processing and product handling. This new, 20 page well illustrated issue of "Food" is well worth having and keeping handy for its fund of new production ideas, advanced techniques and methods, and new product trends. Copies of this publication are now available for distribution.



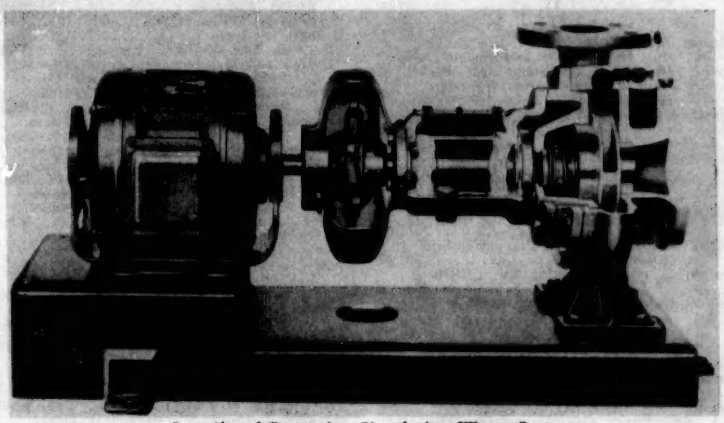
Front Cover of Food Magazine

New Circular on Water Circulating Pumps

A NEW product circular, released recently by Bell & Gossett Company, Morton Grove, Illinois, features the company's complete line of Universal Pumps; a type of centrifugal pump made especially for large circulated water systems where smooth and silent operation is a major requirement.

All commercial and institutional buildings generally fall into this category, it was explained. The vast network of piping through one of these buildings will relay even the slightest noise or vibration in all directions. A pump used to circulate hot water for heating or chilled water for cooling, must have more than just the ability to produce the required capacity. The pump must also be constructed for smooth, silent and continuous circulation. The Universal is the only centrifugal pump available that meets these conditions, it is claimed.

The new circular also shown how a Universal Pump can be used for boosting city water pressures in tall buildings. When a pump is set to operate continuously for long periods of the day or night, noiseless and vibrationless operation is essential.



Centrifugal Pump for Circulating Water System

Classified Advertising

Positions and Help Wanted

WANTED — Manufacturers' representative, Northern New Jersey and Metropolitan New York City, needs an additional line of refrigeration and air conditioning equipment. Twenty-five years of successful sales and competent engineering of both freon and ammonia. Write Box DC-3, c/o Industrial Refrigeration, 435 N. Waller Ave., Chicago 44.

ICE PLANTS—for sale

FOR SALE — Meat processing, cold storage, locker, and ice plant; large building with ten lots. Located in Goodland, Kansas. Will sell on terms. Contact Jesse Topliff, Goodland, Kansas.

FOR SALE — 40 ton ice plant. Brick building, grocery drive-in, thoroughfare, corner; located Houston, Texas. Now operating; selling account sickness. O. W. Fordyce, 1215 Capitol Ave., Houston 2, Texas.

USED EQUIPMENT—wanted & for sale

FOR SALE — 4x4 and 5x5 Fricks, 5x5 and 8x8 Yorks. New 15 ton York shell & tube condenser. Write E. Niebling, 1546 St. Clair Ave., Mount Healthy, Cincinnati 31, Ohio.

FOR SALE
10x10 and 9x9 York compressors, with syn. motors.
7½x7½ York & 7¼x7¼ Baker compressors.
2" pipe coils 8" centers — 1¼" pipe coils 4" centers.
Universal Unaflow steam engine 100 h.p.
Two Troy-Engberg 7x6 steam engines.
JOHN F. CARSON
"A" & Venango Sts. Philadelphia 34, Pa.
GArfield 6-2221

FOR SALE — One Flynn & Emrich 300 lb. ice cuber; excellent condition. Southern New England Ice & Oil, 101 Pope Park Highway No. 4, Hartford 6, Conn.

FOR SALE — York 25 h.p. Freon compressor, self contained (new). Shell tube condenser, receiver, compressor, all makes and sizes. Gordon Equipment Co., 6530 W. Jefferson Ave., Detroit 17, Mich.

WANTED — one used Model 50 or 100 Flynn & Emrich ice cube machine and good used late model Frick compressors and high sides. Gartner Refrigeration and Mfg. Inc., 2913 Lyndale Ave. So., Minneapolis 8, Minn.

FOR SALE — Refrigeration equipment; ice equipment; new, used. Advise us your needs. Use "QUICKSEAL" — stops brine tank leaks; easy, efficient, economical. Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois, WAbash 2-5299.

FOR SALE — 1344 feet of FINNED PIPE — 12' lengths. Made from 2" pipe — 7" fins — 1½" apart. All heavily galvanized. NEW at half price. Also 150 steel hand trucks — roller bearing wheels, $6.00 each new. West Side Cold Storage Co. 7 Harrison St., New York 13, N.Y.

FOR SALE
1 — 12"x12" 4 cyl. late Frick compressor.
1 — 11"x13" 2 cyl. York direct conn. syn. motor.
3 — 10"x10" 2 cyl. York direct conn. syn. motor.
2 — 9"x9" — 2 cyl. York direct conn. syn. motor.
1 — 7"x7" — 2 cyl. Frick direct conn. syn. motor.
1 — 7½"x7½" 2 cyl. York V. flywheel comp.
1 — 6"x6" — 2 cyl. Frick flat flywheel comp.
1 — 5"x5" — 2 cyl. Frick V. flywheel compressor.
3 — 9¼"x14" 115 h.p. Wolverine Diesel engine.
1 — 8 ton Niagara Evap. condenser.
11x22x47" and 11x22x51" ice cans.
Ice Plants — 20 to 100 tons.
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77 Alexander St. Yonkers, N.Y.
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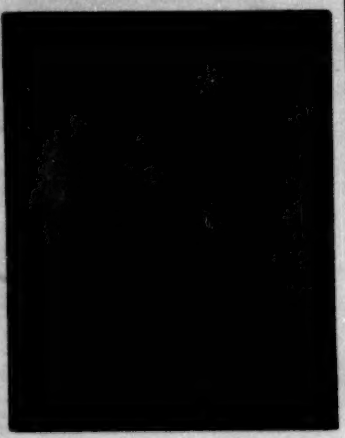

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PRINCIPLES • PRACTICE • OPERATION

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LEESBURG FREEZER CORPORATION
P. O. BOX 62
LEESBURG, FLORIDA

September 29, 1955

Mr. Allen W. Cox, Manager
Low Temperature Insulation Sales
Owens-Corning Fiberglas Corporation
Toledo 1, Ohio

Dear Mr. Cox:

You have asked us how the Fiberglas insulation, which was installed two years ago in our new 2,600,000 cu. ft. plant here in Leesburg, is performing.

We are happy to say that we are 100 per cent satisfied in every respect.

As you know, we regularly store frozen concentrate for important clients like the Minute Maid Corporation, Libby, McNeill & Libby, General Foods, and other large concentraters and Frozen Food Packers, and it is most important that our temperature control is constant.

We have no difficulty in maintaining a -10° temperature at all times, even when our storage space is filled to capacity. In fact, we can even go lower if necessary.

During these past 24 months, there has not been the slightest indication of condensation or icing within the walls. All your claims of efficiency, durability, and economy have been more than fulfilled.

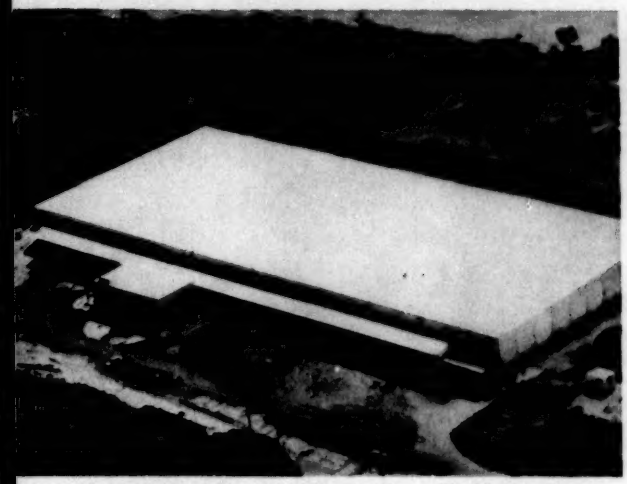
We have been so satisfied with the performance of our Freezer Plant at Leesburg, that we have decided to employ the identical construction in our new 2,600,000 cu. ft. freezer we are now building at Auburndale, Florida.

Cordially yours,

LEESBURG FREEZER CORPORATION

BY C. H. Pitts
C.H. PITTS, GENERAL MANAGER

CHP:bab



LEESBURG FREEZER CORPORATION, Leesburg, Florida, operates this 2,600,000 cu. ft. plant at −10°. Fiberglas PF will also be used in Leesburg's new 2,600,000 cu. ft. freezer at Auburndale, Florida.

OUTSTANDING PERFORMANCE PROVES ITS VALUE!

CHOOSES FIBERGLAS PF DRY WALL FOR NEW 2,600,000 CU. FT. FREEZER

Further evidence of the high thermal efficiency of Fiberglas* PF Dry Wall Construction is given in this recent letter from the Leesburg Freezer Corporation. As General Manager C. H. Pitts states, "During the past 24 months, there has not been the slightest indication of condensation or icing within the walls. All your claims of efficiency, durability, and economy have been more than fulfilled."

Why no condensation? Fiberglas PF Dry Wall construction utilizes a single, highly-efficient vapor barrier. What little vapor does penetrate the barrier passes *through* the Fiberglas Insulation as vapor. The insulation stays dry, stays efficient.

Fiberglas PF saves on construction costs, too. There's no hot asphalt—the insulation is pressed into place between studs or over metal clips.

Another advantage of Fiberglas PF is the trouble-free service it gives. It's rot-proof, odorless, dimensionally stable.

So, *before* you commit yourself to costly multiple barrier insulation, get all the facts on Fiberglas PF Dry Wall Construction. **MAIL COUPON TODAY!**

FIBERGLAS

*T.M. Reg. Owens-Corning Fiberglas Corporation

Owens-Corning Fiberglas Corporation
Dept. 165-L, Toledo 1, Ohio

Please send me the booklets I've checked off.

- ☐ "Insulation for Low Temperature Structures and Equipment"
- ☐ "PF Design Details"
- ☐ "Why the Trend is to Fiberglas"

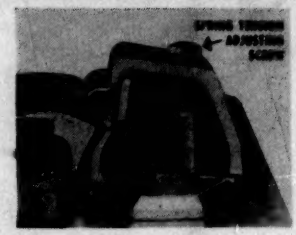
Name and Title _____

Company _____

Street _____

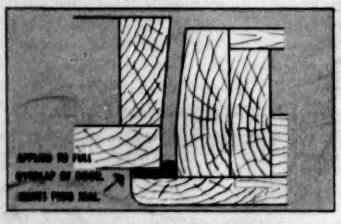
City _____ **Zone** _____ **State** _____

Exclusive JAMISON features make the Series "50" the best buy in cold storage doors



Exclusive JAMISON hardware

- Adjustable hinges and fastener assure tight seal
- Rugged cast construction
- Patented heavy duty design
- Hot dip galvanized finish. Heavy zinc coating gives maximum protection



JAMISON gasketing

- Lo-Temp Gasket—soft, resilient with protective jacket
- Sillseal—flexible, abrasion and grease resistant

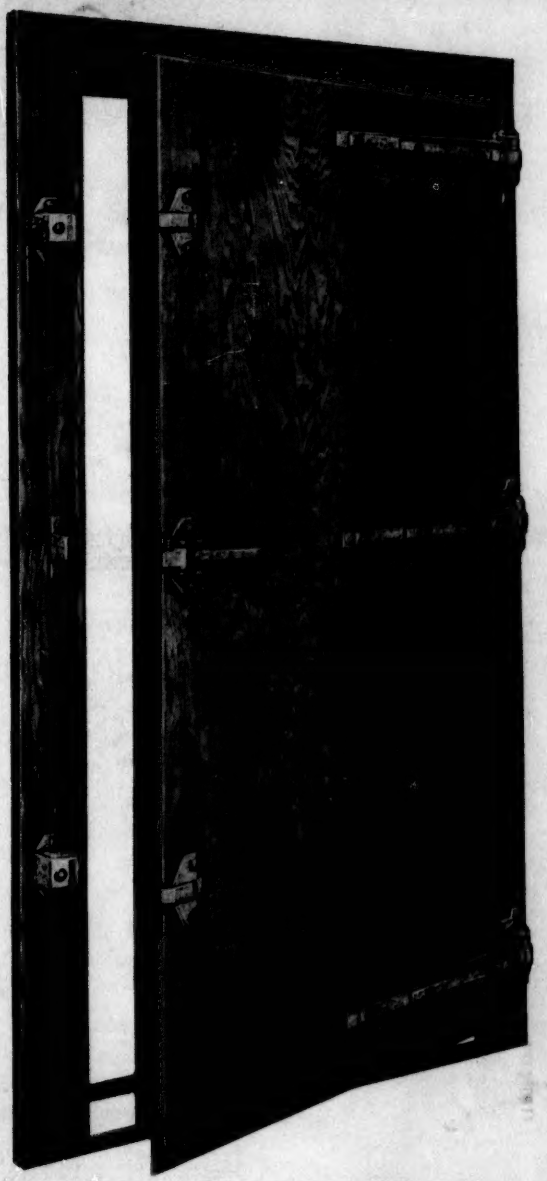
Box girder construction

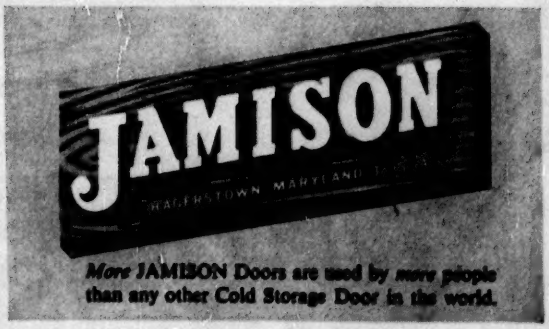
- 5 times more rigid—prevents warping—assures tight seal
- Internal bracing eliminated—maximum insulation
- 7 times stronger—extra durability under hard service

Exclusive boat hull plywood

- Finest quality obtainable
- Water-proof plastic bond
- 7-ply front, 5-ply back panel

For complete data on the Jamison Series "50" Door write to Jamison Cold Storage Door Co., Hagerstown, Md. Ask for Bulletin #3.





More JAMISON Doors are used by *more* people than any other Cold Storage Door in the world.